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ORIGINAL MEMOIRS.

A REVIEW OF FIVE HUNDRED CASES OF GASTRO-ENTEROSTOMY, INCLUDING PYLOROPLASTY, GASTRODUODENOSTOMY, AND GASTRO-JEJUNOSTOMY.[1]

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THE writer has included in this series all of the cases in which there has been an incision made into both the intestine and stomach and plastic union established between the two organs with the intent to increase gastric drainage. The term gastro-enterostomy is used in its literal sense, the formation of an artificial passage between the stomach and intestine; the terms pyloroplasty, gastroduodenostomy, and gastrojejunostomy being used as expressing more accurately the exact method employed.

The series of cases have been worked out with a view of showing the actual results of operation both as to mortality and the percentage of secondary operations. The method of computing mortality herein followed is to charge as a death from operation every case dying in the hospital without regard to cause of death or length of time after. It includes cases dying as long as three months after operation, from coincident chronic nephritis, etc., and might be called the combined mor-

[1] Read before the American Surgical Association, July, 1905.

tality of operation and disease. This works a hardship on the statistics, but it eliminates the personal equation. The statistics include every case Dr. Charles H. Mayo and myself have operated upon up to June 20, 1905; the early cases showing a particularly high mortality. The secondary operations were repeated in some instances two to five times before good results were obtained, so that the number of such procedures was nearly double the number of cases reported.

Pyloroplasty, 21 cases. No deaths. Seven secondary operations (33⅓ per cent.). Gastroduodenostomy, Finney, 58 cases, four deaths (6.9 per cent.). Two secondary operations (3.4 per cent.).

Gastrojejunostomy. Total, 421. Benign, 307 cases, 19 deaths (6½ per cent.). In the last 140 there were four deaths, a mortality of 2 $^{6}/_{7}$ per cent.; last 80 gave but one death. One hundred and fourteen malignant, with twenty-one deaths (18 per cent.). Of these 114 cases, 63 were in connection with pylorectomy and partial gastrectomy, with eight deaths (13 per cent.). The very unfavorable cases of cancer obstruction were subjected to gastro-enterostomy, so that this operation gives a higher mortality than radical excision. In the last 40 gastrojejunostomies for malignant disease the mortality was 8 per cent. In the 421 gastrojejunostomies there were 21 reoperated cases (5 per cent.).

PYLOROPLASTY.

The pyloroplasty of Heinicke-Mikulicz, in our experience, has but little risk in suitable cases, but it is open to objection. It enlarges the caliber as much in an upward direction as downward in the line of drainage, and the extent to which this enlargement can be carried out is limited. The pylorus, following this operation, is exceedingly prone to become adherent, so that the opening remains at a high level. The stomach, if greatly dilated, must elevate the food to the high lying outlet, and it frequently happens that the degenerated muscle fibres are incapable of the muscular effort, and, as a result, the patient is not materially benefited. In three cases

we fastened the pylorus, after operation, to the region of the umbilicus by suture, to secure a low drainage point, taking advantage of the fact that adhesion after operation was the rule, to secure fixation at a more favorable situation. These three cases have continued in good health, but there are valid objections to the plan. In the seven cases which came to secondary operation, the adhesions were most marked. Gastrojejunostomy in each case resulted in cures. In the remaining 14 cases, cure resulted. In four cases, an ulcer was excised at the same time with favorable result. Pyloroplasty has a small field of usefulness, but in performing it the later plan of Mikulicz should be adopted. The incision should be curved downward upon both the stomach and duodenum, much like the Finney method, the result being to give an increased caliber over pyloroplasty as ordinarily performed, and establishing better drainage lines.

The principle in plastic union, established by pyloroplasty, is one of the first importance and widely used in surgery. It is especially valuable in choosing the line of closure after excising gastric ulcers, etc.

GASTRODUODENOSTOMY.

Strictly speaking, this operation implies a separate opening between the stomach and duodenum, such as the Kocher operation; but, as the method of Finney more easily answers the same purpose, we have followed this plan in the entire group of 58 operations, with four deaths and with two secondary operations. (Mortality, 6.9 per cent. Secondary operations, 3.4 per cent.) In the first 46 cases there was only one death, in the next 12 there were three deaths. It does not seem fair to count two of the deaths, as one was from pneumonia after complete recovery and one from embolus due to an old endocarditis. We had an opportunity to re-examine the operated field in three individuals after a number of months, there were extensive adhesions present in two.

Subjects for this operation should be carefully selected; extensive disease, adhesions, a short gastrohepatic omentum,

and especially the presence of scar tissue, should be considered a contraindication, as it is in just these varieties that gastrojejunostomy gives the most satisfactory results. Two of the four deaths we had were due to suture leakage on account of tension in scar tissue.

In open ulcer the food must still pass the ulcer area to reach the pylorus, and ulcer does not depend on obstruction, as shown by the frequency of duodenal ulcer beyond the possibility of obstruction. Reasoning on this ground, we would not expect the curative results from gastroduodenostomy in active ulcer which we would get from gastrojejunostomy made to the left of the ulcer-bearing area, and our experience bears this out; in this class of cases it has not given the same measure of relief. The importance of this objection is somewhat minimized by the fact that the line of enlargement is not only downward in the line of drainage, but also along the greater curvature, which is seldom involved in ulcer. The opening can be made of ample size, and it avoids the risks habitual to gastrojejunostomy, as it leaves the outlet at its proper situation. We were enabled, in four cases, to combine with the Finney operation an excision of the ulcer. In selected cases this Finney method is the one of choice.

There were two secondary operations in this group; in both individuals bile came into the stomach, causing distress. We had made the opening too large, as shown at reoperation. One case had severe hæmorrhage from insecure suturing, and required reoperation in twenty hours, with recovery.

GASTROJEJUNOSTOMY.

Gastrojejunostomy, 421 cases. Benign, 307 cases, 19 deaths (6 per cent.). Secondary operations, 20 (6½ per cent.). Malignant, 114 cases, 21 deaths (19 per cent.). One secondary operation 0.9 per cent.). Of these operations, 63 were made in connection with pylorectomy and partial gastrectomy.

The writer has been greatly interested in gastrojejunostomy. No operation in surgery has conferred greater benefit

upon suitable patients than this one. Unfortunate experience, however, sharpened the investigation as to the causes of deaths and the complications which we found to be more or less inherent in every method with which we became acquainted. In all but three of the fatal cases, a post-mortem examination as to the cause of death was obtained.

It has only been of late that we have secured a method which could be depended upon to give good results steadily with a sufficiently low mortality to justify its employment in cases in which disability, rather than impending death, was the spur to operative relief.

The first claim to investigation comes with the question, Shall the operation be made anterior after Wolfler, or posterior after von Hacker? Of the total number of cases, 126 were anterior and 295 posterior. The mortality in the anterior group was somewhat over 1 per cent. higher than in the posterior, but the percentage of secondary operations was greater after the posterior operation. The mortality comparison is, however, hardly fair to the anterior method, as this group comprises a larger number of the early operations in which inexperience can be blamed for some of the misfortunes.

For benign disease, the posterior operation is the one of choice. It is applied at a higher point on the jejunum, and is unattended with the risk pertaining to the presence of the loop which must surround the transverse colon. That this loop is of dangerous import is shown by two of our secondary operations, in one of which a number of feet of small intestine travelled through the noose, and in the second, death was directly traced to adhesion and obstruction of the transverse colon. The length of this loop is from sixteen to twenty inches, a disadvantage when one considers the proportionally high value of the upper jejunum in digestion and absorption. The anterior operation has some few indications. In cancer the disturbance is less, and, as the gastric juice has little acid, the patient cannot be expected to live long enough to develop a secondary jejunal ulcer. The anterior operation is more liable to be followed by contraction on account of the traction weight

of the attached jejunum, a diverticulum formation of the intestine takes place which is followed later by contraction. This happens most frequently after the button, as the line of union is narrow and it has less of a grasp on the tissues. Contraction, however, is liable to occur after any form of operation, especially if the pylorus is unobstructed. With an open pylorus nature tends to close the opening, no matter what form of operation; but the shorter the loop, the less the probability of contraction, and in the operations without a loop we would not consider it a serious question. We have seen a reduction of one-half take place three and five months, respectively, after a Moynihan operation on a nine-inch loop.

Vicious circle, as the regurgitant vomiting is generally known, is less liable after the anterior than the posterior operation. The traction weight of the attached intestine tends to keep the bowel pulled away from the stomach, while, after the posterior operation, there is a greater tendency for the development of a kink or flattening of the intestine against the opening (Cannon and Blake). In spite of the objections which we present to the anterior operation, we have a large number of operated cases after this method in perfect health for periods of time up to twelve years.

Angulation and obstruction are the two great causes of regurgitant vomiting, and, in our experience, the short, posterior loop of from seven to ten inches gave the greatest number of such complications. Acute, vicious circle occurs very rarely, if the opening be placed at the lowest point of the gastric cavity; but a considerable number of patients begin to have trouble, usually, within two or three months, as pointed out by Ochsner. This condition often increases, and in from six months to a year gives sufficient annoyance to require a secondary operation.

Murphy Button. Total, 157 operations. Benign, 72 operations, 6 deaths (8 per cent.), 54 anterior, 4 deaths (8 per cent.), 4 reoperations (8 per cent.). Eighteen posterior, 2 deaths (11 per cent.), 4 reoperations (22½ per cent.).

Malignant, 85 operations, 15 deaths (18 per cent.), including pylorectomy and partial gastrectomy.

The Murphy button is least liable to be followed by passage of bile into the stomach. While in position, it mechanically prevents kinking, and the character of the permanent opening does not favor angulation. Four of the deaths were caused by pulling apart of the attached surfaces in from six to ten days subsequent to operation, and after the button had passed along the intestine. We now always protect the button union by four or five mattress sutures of silk at intervals. A continuous suture outside the button may prevent its passing out of position and cause it to lodge and act as a foreign body. If it were not for the frequent retention of the button in the stomach, the posterior button method, without a loop, would be ideal. Twice we have had to remove a retained button for symptoms. After pylorectomy and partial gastrectomy for cancer, we nearly always employ the button. It gives an immediate opening and is particularly free from secondary complications. In one out of three direct anastomoses by the Kocher method, between the duodenum and stomach after partial gastrectomy, a second operation was required in eight weeks to relieve angulation and obstruction.

McGraw Ligature. Total, 36 operations. Benign, 17, 2 deaths (11.7 per cent.). Malignant, 19, 3 deaths (15.7 per cent.). We have used Ochsner's technique and found it very satisfactory.

The McGraw ligature method anterior has been very free from bile regurgitation and is exceedingly safe. It can be placed in bad tissues and can be used in poor subjects. We have four times used this operation with a hæmoglobin of less than 25 per cent.; once 20 and once 24 per cent., in bleeding ulcer, with recovery; once with the hæmoglobin 24 per cent. in cancer with acute obstruction, with recovery; once with hæmoglobin of 10 per cent. in cancer with hæmorrhages simulating ulcer. The latter case was scarcely conscious at time of operation. He lived three days, and, although a stout, heavy rubber cord was used and tightly tied, there was no sign of an opening at the postmortem. It requires some vitality to cause the tissue to cut through. This man did not

have sufficient resistance to set up atrophy necrosis, and the result was the same as in a cadaver. Two cases of cancerous obstruction with a considerable quantity of free fluid in the abdomen recovered after a ligature operation. Tissues which are of poor vitality, but which have some power of repair, will do so after a McGraw ligature. The button might set up an uncircumscribed slough, or the suture become easily infected, if these methods were chosen. The McGraw operation, including opening and closing the abdomen, can be done in twelve minutes, without hurry. The disadvantages are, that it should be, or has been, used with the loop, and, like any loop operation, the opening may contract. Again, it does not allow of immediate feeding. This fact and the uncertainty of the time of the ligature cutting through render the method one for the occasional rather than the average case. We had one case of acute regurgitant vomiting after the McGraw ligature, which was reoperated on the fourth day. The ligature had been badly placed and the opening lay at one side of the centre of the bowel.

Posterior Suture.—Total, 228 operations. Ten malignant, with 2 deaths (20 per cent.). Two hundred and eighteen benign, with 11 deaths (5 per cent.).

We do not do an anterior suture operation. The increased risk of contraction and jejunal ulcer which unavoidably attends the anterior method would, with the suture, also increase the chances of bile regurgitation.

In May, 1901, Mr. Robson demonstrated in this country the bone bobbin operation, with the suture on a posterior ten-inch loop. We did fifteen by this method, with one death, and found it very satisfactory.

In June, 1903, we began the method of Mikulicz, making the opening within three or four inches of the origin of the jejunum and using a transverse incision. We made forty-three by this method with four deaths, two of which could be fairly excluded. Four required a second operation at our hands, and to a large extent because we departed from the originator's technique. It came about in this way: The transverse intes-

tinal incision limits the size of the opening to one-half the diameter of the intestine, less about one-fourth inch suture line, and the opening could seldom be made larger than could admit the invaginated thumb. We tried to enlarge this by encroaching on the bowel, and caused a valve to form, which turned the bile into the stomach. These patients gave us a lot of trouble, the short upper limb of the loop made an ordinary entero-anastomosis of the two arms of the bowel impossible. We finally united the intestine each side of the opening in exactly the same manner as the Finney operation at the pylorus. The result was good. This was our first experience with the short proximal loop; the cases which recovered after this method have remained in splendid condition, despite the small opening. In October, 1903, Dr. Charles H. Mayo did two operations with a longitudinal, intestinal opening without a loop and as short as possible, practically the operation we are doing now. Both recovered and remain well.

In the summer of 1903 Mr. Moynihan demonstrated to us the method he was using with the clamp, and which goes by the name of the " Moynihan Operation," using the oblique, posterior incision of the stomach wall and a nine-inch loop. The use of the clamps simplified the technique, and the opening could be made very large. We made fifty-three after this method with three deaths. The primary results with the Moynihan operation were good. Not a case of acute vicious circle, but in the course of a year seven cases required a second operation for the distress caused by bile regurgitation, either occasionally in large quantities or frequently in smaller amount. In June, 1904, we began the operation on the Roux principle, doing a posterior gastro-enterostomy on a nine-inch loop with entero-anastomosis. The proximal loop was then obstructed (*a*) by Scott-Matolli suture, (*b*) Fowler's silver wire, (*c*) division of intestine, turning in both ends after Doyon. There were forty-eight of these, with two deaths. Two required a second operation, in one the silk suture in the longitudinal pleating had passed into the intestine. The infection caused adhesions, angulation, and bile regurgitation. In the second, in which the

proximal intestine had been divided, the cut end intussuscepted through the upper part of the lateral anastomosis, causing obstruction. This complicated operation was of too serious a character to apply to every case, requiring from forty-five to fifty minutes for its performance, and on January 1, 1905, we began the routine use of the posterior suture operation without a loop, in the same manner as used in the two cases operated upon by Dr. Charles H. Mayo in October, 1903.

The operation of choice is without a loop. Fifty-six operations, 1 death (1.8 per cent.).

This operation became popularized by the writings of Peterson, of the Heidelberg clinic, Czerny having used it for years, usually with the Murphy button, and with splendid success. At the time Peterson brought out the favorable features of the method, we had practically abandoned the button for the suture in benign disease, and the operation could not be easily done with a longitudinal opening without the holding clamps, which Moynihan and Littlefield later popularized. Mikulicz, as already pointed out, was doing the operation with the transverse incision.

To properly appreciate the advantages of the "no loop" method, some physiological and anatomical facts must be understood (Fig. 1). The stomach is not a bag, but a muscular organ, and when empty the pylorus is not far from the lowest point, and lies nearly in the median line of the body. As the stomach distends, the organ becomes more nearly horizontal by the elongation of the greater curvature. The pylorus passes to the right of the median line and relatively passes above the greater curvature. The gastro-epiploic artery sets away from the greater curvature about three-fourth of an inch, when the stomach is empty, and sends its gastric branches upward on the anterior and posterior gastric wall, which it meets above the actual line of the greater curvature. This arrangement of the blood-vessels enables rapid distention of the stomach, without interference with the blood-supply. The lesser gastric curvature is more fixed in position and can be divided into two parts; the perpendicular portion which drops

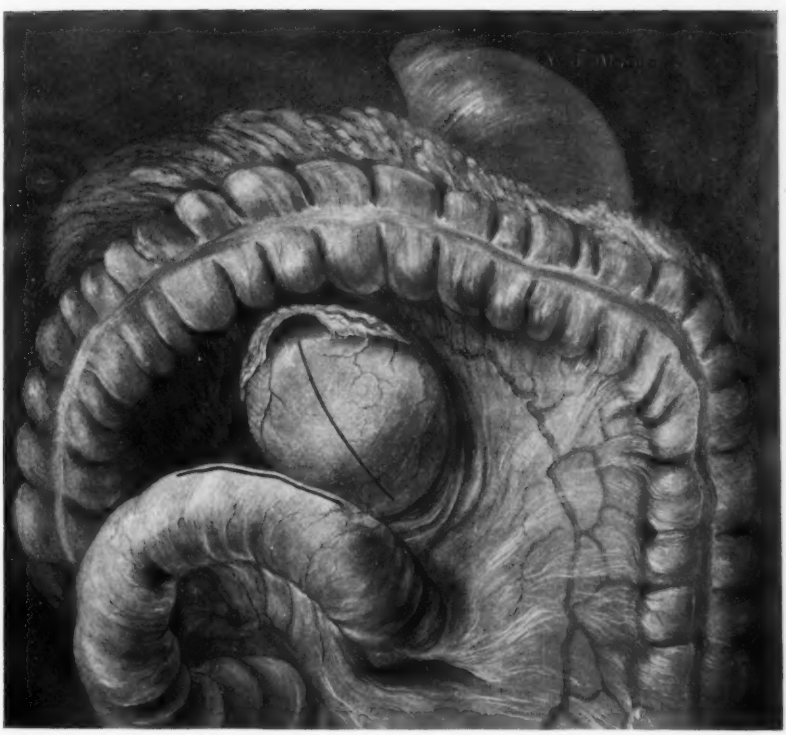

FIG. 1.—Showing posterior wall of the stomach drawn through a rent in the transverse mesocolon. Note slight separation of gastrocolic omentum from its attachment to the stomach, permitting anterior wall of stomach to appear, and insuring drainage at lowermost level. Black lines mark site of proposed anastomosis; the jejunum shows at its origin.

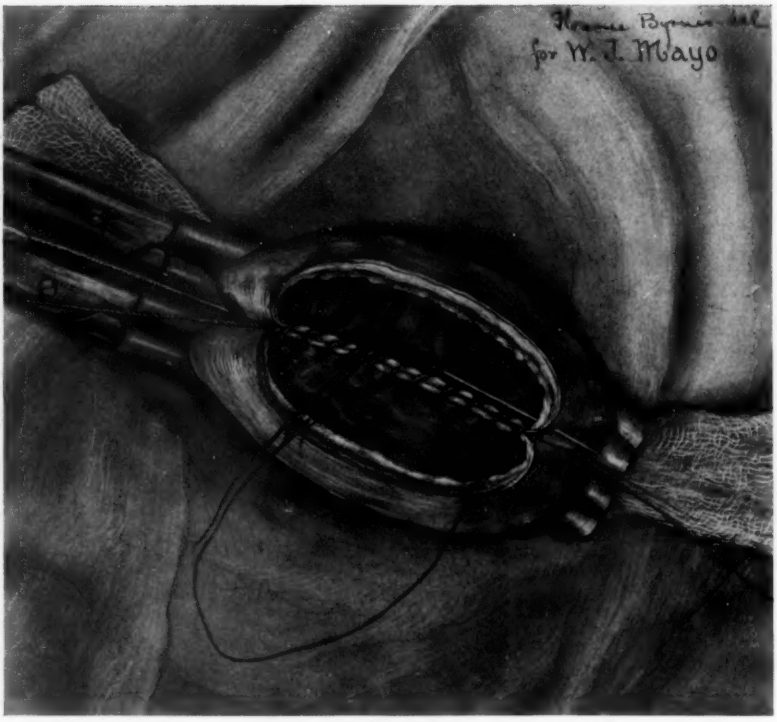

FIG. 2.—Forceps in place and anostomosis half completed by suture.

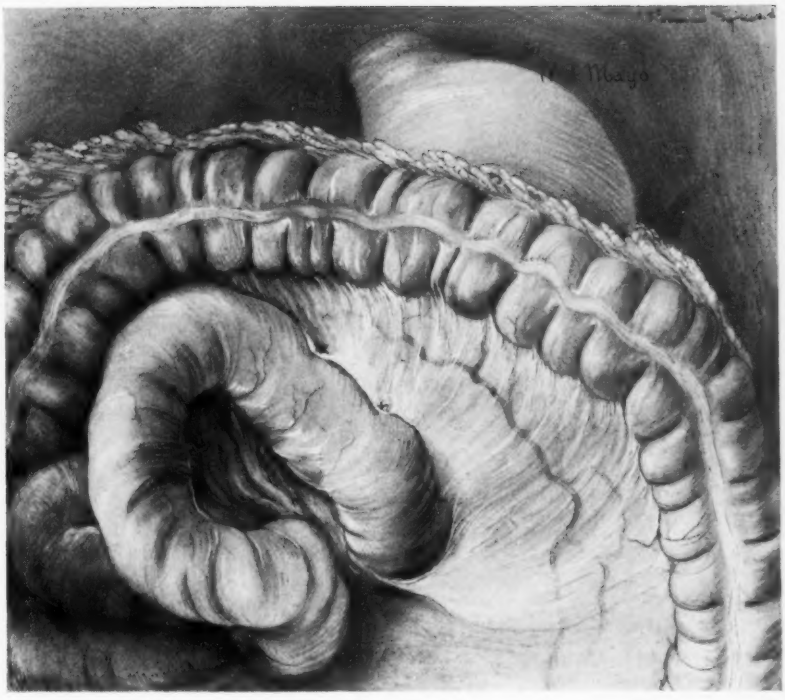

FIG. 3.—Completed operation from behind margin of torn mesocolon attached by several interrupted sutures to line of union.

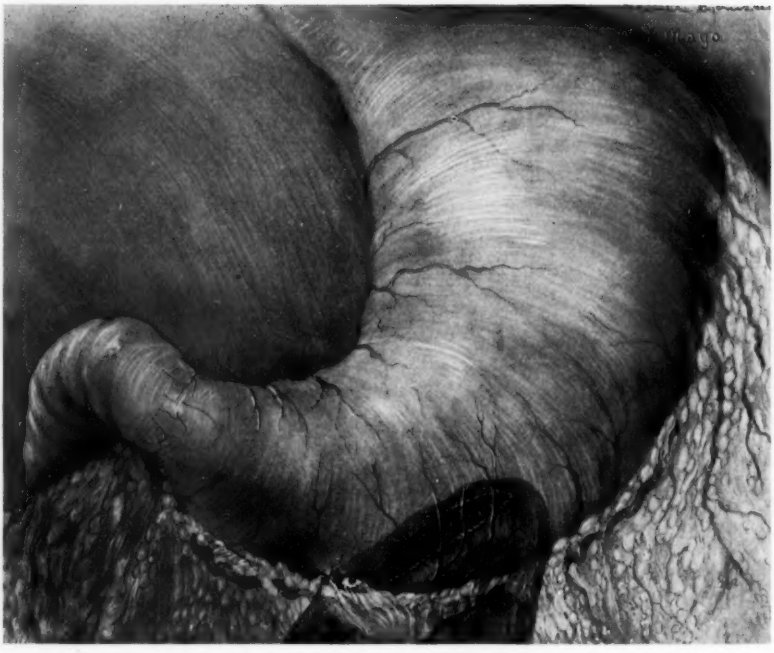

FIG. 4.—Completed operation from in front. Anastomotic opening shows through as darkened area on posterior wall. Note that it goes to the bottom of the gastric cavity and slightly anterior, as indicated by suture line in the omental attachment.

nearly vertically from the right margin of the cardiac orifice (about one and one-half inches to the left of the mid-line), and the horizontal or slightly curved portion, which turns sharply to the right and ends at the pylorus. Ordinarily, the concavity of the lesser curvature is from two to three inches, the corresponding point on the greater curvature being three and one-half to four and one-half inches, making the convexity of the pyloric segment. This is the grinding muscular portion of the stomach, the part subjected to the greatest amount of traumatism, and over 80 per cent. of all the lesions for which we are called to operate are either in this part or in the first two and one-half inches of the duodenum. The gastrojejunal opening should be placed just to the left of this portion of the stomach (Fig. 2). The inferior margin of the gastrojejunostomy should lie at the greater curvature, on a line opposite the juncture of the transverse and longitudinal parts of the lesser curvature. This is rather farther to the right than has usually been practised. The duodenum passes through the mesocolon, nearly on a perpendicular plane with the cardiac orifice, one and one-half inches to the left of the mid-line, and when the stomach is empty its lower border lies nearly on a line with the origin of the jejunum. When the gastric cavity is distended or dilated, it descends and covers this point. The proper situation of the gastric opening should be oblique on the posterior wall, beginning on the body of the stomach between the lesser and greater curvatures, and extending downward to the very bottom of the stomach—Moynihan's line (Figs. 2 and 3). To insure that the opening shall be at the very lowest point at its right margin, we slightly separate the omentum from the greater curvature and pull one-fourth inch of the anterior wall out posteriorly, pushing the gastro-epiploic vessel out of the way (Fig. 4).

In previous contributions to this subject we have called attention to the changed nature of the proximal arm of the jejunal loop after gastrojejunostomy. It becomes succulent and thick. With the loop operation, the food could and did pass into the proximal arm, while the peristalsis of this short

end was inefficient, and herein lay most of the difficulties. Peterson developed the fact that if the jejunum were attached short without a loop, it would require a reverse peristalsis to carry food into the duodenum. Peterson's point of jejunal election lies within from one to three inches of the origin of the jejunum, varying as necessary to enable easy attachment to the stomach (Figs. 1 and 2). It will be noted that the line of proposed union is a natural one. The jejunum attaches to the stomach without kink or bend in the line of gastric activity (distention and contraction). The intestine comes off the bottom of the stomach as though it were mortised on, the opening extending upward and to the left. As Cannon and Blake have experimentally proven, and we have clinically demonstrated, the food will pass out of the unobstructed pylorus after any method of gastrojejunostomy; with this method of operation it makes little difference. Spasm of the whole pyloric end of the stomach which quickly follows ulcer or other irritation no longer holds back the food and secretions. The gentle compressing action of the cardiac end is quite sufficient to turn the secretions and delayed ingesta out the gastrojejunostomy. Relief of the pyloric obstruction, no matter its character, permits normal progress. Interruption of this calls the new opening into use. It is not at all necessary for the chyme to enter the duodenum to stimulate pancreatic and biliary discharge. This happens whenever the gastric product enters the small intestine at any point. In all the loop operations, more or less of the jejunum, at its most important situation, is thrown into a by-channel. The opening of the common duct lies four inches below the normal pyloric entrance of food. This operation brings the common duct opening eight inches above the gastrojejunal food entrance, and the constant presence of biliary and pancreatic alkaline secretions will certainly render secondary jejunal less frequent than primary duodenal ulcer.

To recapitulate:

(1) The gastric opening should be placed on the posterior wall, obliquely from above downward, and left to right (Fig. 1). (Moynihan's line.)

(2) The lowest point of the gastrojejunostomy should be at the lowest point of the stomach, on a plane perpendicular with the cardiac orifice (Fig. 1).

(3) To insure this effect, the gastric incision should extend one-fourth to one-half of an inch onto the anterior wall (Nos. 1, 2, 3, and 4).

(4) The incision in the intestine should be longitudinal, opposite the mesentery, and begin from one to three inches from the origin of the jejunum, measuring on the anterior surface. (Peterson's point of election, Figs. 1, 2, and 3.) The exact distance depends on the ease of attachment, as short as can be conveniently done without tension.

A description of the operation is, briefly, as follows:

(*a*) The abdominal incision is made four inches in length, three-fourths inches to the right of the middle line, the fibres of the rectus muscle being separated. The lower end of the external wound lies opposite the umbilicus. This opening also enables inspection of the duodenum and gall-bladder and is reliable against hernia when closed.

(*b*) The transverse colon is pulled out and the mesocolon made taut by traction upward and to the right, in this manner bringing the jejunum into view at its origin.

(*c*) About three to four inches of the jejunum opposite the mesentery are drawn into a slightly curved clamp. The handles of the clamps should be to the right, to enable a short grasp on the intestine. Three-fourths of the circumference of the bowel is pulled through; the posterior border is not included, to prevent entanglement of the suture with the redundant posterior mucous membrane. The holding clamps are applied sufficiently tight to check hæmorrhage and prevent extravasation of intestinal contents.

(*d*) The ligament of Treitz is a short muscular mesentery covered by a variable peritoneal fold (too variable for a reliable landmark) extending upward from the origin of the jejunum on to the mesocolon. This peritoneal fold lies at the base of the arterial loop of the middle colic artery which supplies the transverse colon. The mesocolon is opened within the vas-

cular loop and the posterior inferior border of the stomach pushed through. A small separation of the greater omental attachment to the stomach enables the anterior gastric wall to be drawn out posteriorly. The posterior gastric wall is drawn into a clamp, with the handles to the right, in such a manner as to just expose the anterior wall at the base.

(*e*) The two clamps are laid side by side and the field carefully protected by moist gauze pads. With fine, celluloidal linen thread, on a straight needle, the intestine is sutured to the stomach from left to right by a Cushing suture at least two and one-half inches.

(*f*) The stomach and intestine are incised one-sixth inch in front of the suture line and the redundant mucous membrane excised flush with the retracted peritoneal and muscular coats. With a No. 1 chromic catgut on a straight needle, the posterior cut margins of the entire thickness of the gastric and jejunal wall are united by a button-hole suture from right to left; at the extreme left the suture changes to one which passes through all the coats, of each side alternately, from the peritoneal to the mucus, then directly back on the same side from the mucus to the peritoneum. This acts as a hæmostatic suture, and also turns the peritoneal coats into apposition. It passes around the anterior surface and is tied to the original end, which has been left long for the purpose. If silk or linen is used for this suture, it may hang *in situ*, suppurating for months.

(*g*) The clamps are now removed and the linen thread continued around until it is tied to the original end, firmly catching the blood-vessels in sight along the suture line. The parts are carefully cleansed and inspected. If necessary, a suture or two is applied, to accurately coapt or to check the oozing.

(*h*) The margins of the incised mesocolon are now united to the suture line by three or four interrupted sutures, and the parts returned into the abdomen.

After-Treatment.—On being placed in bed, a glass female douche point is passed just above the internal sphincter ani.

attached to a gravity bag filled with one-half strength normal salt solution. The elevation should not be greater than six inches. The small stream passing into the rectum is readily absorbed without irritation. One or two quarts are taken up in an hour. (Murphy.) The patient is then placed in the semi-sitting posture. Beginning at sixteen to twenty hours, an ounce of hot water is given every hour; this is rapidly increased, and in thirty-six hours the usual experimentation with liquid feeding is instituted. Rectal feeding is unnecessary. The operation is, in all of its essential parts, that of Mr. Moynihan.

We are much indebted to Munro and Bottomly, of the Carney Hospital, Boston, for suggestions in technique, as elaborated above, and for the opportunity they have afforded Miss Burns to make the drawings, herein shown, from actual operations at their hands.

SPLENECTOMY FOR MYELOGENOUS LEUKÆMIA.

REPORT OF LATER HISTORY OF A RECOVERED CASE, AND ULTIMATE DEATH FROM LOCOMOTOR ATAXIA.

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In an article on the Surgery of the Spleen, by Dr. Warren, the details of the following case were published, with remarks upon it by Dr. Whitney (see ANNALS OF SURGERY for May, 1901). In brief, the case is as follows:

Mrs. E. M. D., a patient of Dr. J. F. Croston, of Haverhill, I saw on December 12, 1900. In February, 1900, she first noticed a bunch in the left side of the abdomen. When I was called to see her, I expected, from the history, to find an ovarian tumor with twisted pedicle. The patient's mind had been prepared for operation, and everything was in readiness for it. Under ether the tumor was clearly an enlarged spleen. The outline was characteristic, the spleen was freely movable, the patient was in excellent condition.

No examination of the blood had been made, and none was at the time possible. The patient had, with the greatest reluctance, consented to operation. The physician and the family were sure that she could never again be brought to consider an operation,—a conviction which subsequent experience showed to be correct.

The question whether to remove the spleen or not had to be decided upon the spot. The enlarged spleen might mean any disease of that organ associated with great hypertrophy. All splenic tumors are necessarily serious, excepting, perhaps, the chronic enlargement seen in malarial districts. In some tumors of the spleen extirpation promises well for permanent cure; in others the outlook is practically hopeless. Without prolonged study of the case and careful blood examination, it was impos-

sible to give any opinion of value as to which class this tumor might belong.

The question of operation was carefully but briefly considered. The possibility of a myelogenous leukæmia was the most conspicuous feature of this case. I had seen many such cases, in none of which did extirpation of the spleen present the least hope of success. Indeed, I had never seriously considered operation.

In the present case, even if the spleen was a part of a leukæmia, its great mobility promised an easy and bloodless operation. If there was no leukæmia this spleen in the absence of malarial history belonged to the class of anæmias, and extirpation would give every chance of success.

I decided to operate, for if ever a splenectomy in myelogenous splenic leukæmia could be justified by prospective ease of technique, it would be in this case. The favorable prognosis as to operation gave hope that at least the successful extirpation of a leukæmic spleen would aid in settling definitely the real value of surgical treatment. However discouraging the experience of others had been in the removal of the spleen, it had been no more unsuccessful than medical treatment had always proved eventually.

The spleen was quickly removed without the loss of a teaspoonful of blood. The specimen was examined the next day by Dr. Whitney, and the diagnosis of splenic myelogenous leukæmia was made. His report was as follows:

"SPLEEN. Leukæmia. The spleen was removed by Dr. M. H. Richardson on December 12, 1900, and was received within three hours of the time of its removal and while yet warm. It was very much enlarged, weighing 2275 grammes, and measured 25 centimetres in length by 16 in width and 9 in thickness. Its shape and form were, in general, regular; but on one part of the surface there was a slight depressed area measuring 4 centimetres in greatest extent, and of a deep yellow color. This was evidently the result of an anæmic necrosis. Otherwise, the spleen presented no remarkable appearance externally. The capsule was smooth and of normal color. It was of moderate firmness.

"On section, it was uniform in texture and of a pale grayish red color. The openings of the vessels were visible, the follicles not to be made out with the eye, and the trabeculæ only here and there to be seen. At the hilus was a large vein filled with a loose grayish red thrombus. The blood which came from the vessels was of a pinkish red color and

formed rather loose coagula. Lying at the hilus, attached to the spleen, was a small lymph-node the size of a bean, and another a little larger had been removed separately.

"*Microscopic Examination.*—The spleen was hardened in Zenker's fluid and stained in various ways. With a low power the follicles were seen as occasionally widely separated accumulations of lymphoid cells which stained deeply. Between them the spleen pulp was very much increased, the openings of the veins were prominent and could be readily detected. On examination with a high power numbers of large mononucleated cells were found lying in the meshes of the reticulum associated with eosinophiles in large numbers. The reticulum was not increased in thickness, but the spaces seemed to be dilated, and in this way the increase in bulk was brought about.

"The examination of the lymph-nodes showed the lymph channels filled with large mononuclear cells, among which were occasional eosinophiles. The medullary strings were replaced by similar tissue, but less compact, and in which were very numerous eosinophiles and large multinucleated protoplasmic masses (giant cells). There was only a narrow zone of lymphoid tissue to be found in the periphery. The infiltration in the gland had apparently taken place from the hilus outward.

"Microscopic examination of the blood, taken at the time of the operation, showed the characteristics of an advanced leukæmia, viz., myelocytes, largely increased number of eosinophiles, and the presence of macrocytes and microcytes, together with numerous megaloblasts and normoblasts. The absence of lymphoid cells was noticeable. Examinations of the blood, made at short intervals until a month after removal, showed essentially the same features without any material change, except in the last examination, January 10, there appeared to be fewer myelocytes in proportion to the polynuclear leucocytes. There was no increase in the lymph elements."

The patient made a quick recovery, and was soon up and about. She improved wonderfully in health, and became able to perform her household duties and to enjoy life.

The blood was repeatedly taken and examined by Dr. Jones, who spent much time in the care and study of this case.

The patient early began to object to the taking of blood for examination, though every effort was made to induce her to consent. The more that was done for her, the more obstinate and suspicious she became.

For two or three years she seemed in perfect health. The family moved about the State, and was very difficult to trace. Finally, the patient came under the care of Dr. F. W. Anthony, of Haverhill, who, in February, 1904, reported as follows:

"The patient has been quite well since the operation, except

for a profuse flow every two weeks. This flow continued up to four months ago, since when there has been none. Her knees have been painful for some time, but are better now. Seven months ago she began to have attacks of profuse nose-bleed, which occurred every two or three weeks, and later she had attacks of rectal hæmorrhage, at intervals of three or four weeks. A short time ago she noticed pain and swelling of the left fourth metacarpal, with spontaneous fracture. The right wrist has been swollen at times. The eyesight has been poor for seven months. The left optic nerve is nearly, the right entirely, destroyed. There are no knee-jerks. The Argyll-Robertson reaction is present. There has been difficulty in walking, but no general ataxia; rather a general muscular weakness. The patient has been completely blind for two weeks. She is now stupid and sleeps most of the time. She does not want to be touched or disturbed in any way."

Dr. Jones made another attempt to get a specimen of the blood, but without success.

On November 16, 1904, Dr. Anthony reported:

"In a general way I saw her in 1903. She had then a typical locomotor ataxia, absent patellar reflex, ataxia of station and gait, eyesight nearly absent, spontaneous fracture of one or two fingers, painless swellings of several joints, general weakness. She complained of no abdominal symptoms. She declined all interference, even to the extent of obtaining a drop of blood for examination; and died the picture of death from locomotor ataxia."

I regret exceedingly that I am unable to present the details of this patient's final condition. A few things are, however, worthy of mention. The first important fact was the great improvement in the blood which followed the operation. It became normal. How long the blood continued so, I cannot say. It was probably for some time, for her general health was apparently restored. There was no greater improvement, however, than is seen occasionally in the regular course of the disease under medical treatment. We cannot, therefore, claim for the operation the improvement seen in this case.

The second fact is the distressful condition that the patient was in for some months previous to her death. I did not

see her, but she was reported by Dr. Jones and Dr. Anthony to be a great sufferer. It is a question whether her condition was worse than is usual in such cases. I do not know. It could not, under any treatment, have been any worse than it was. I do not think, however, that it is any fairer to assume that the late bad condition was the result of the operation than to assume that the early improvement was the result of it.

It seems to me a more reasonable assumption that the extirpation of the spleen had no effect upon the disease, one way or the other, early or late; that the improvement noted was the result of medical treatment following the operation; that the final break-up was the natural course of the disease.

Finally, I would say that if the early success of this case has encouraged others to extirpate a spleen in myelogenous leukæmia, it has done distinct harm. That the case may no longer be quoted as a case of successful operation in this disease, it has seemed important to publish the ultimate result. It is to be regretted that the patient could not be studied, and that no autopsy was made.

It is quite possible, of course, that my conclusions are unwarranted. A disease in which successful extirpations of the spleen are so unusual that the very success of the operation is to some minds the strongest evidence against the diagnosis, —in which almost the only successful operation has been followed, after temporary improvement, by a distressing death, —such a disease must by common sense be removed from the category of surgical affections, even if there is, as in this case, no positive proof that the final bad result is directly dependent upon the operation itself.

ON RUPTURE OF INTESTINE.

WITH REPORT OF A CASE IN WHICH RUPTURE OCCURRED FROM MUSCULAR ACTION, AND RECOVERY FOLLOWED OPERATION.

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RECOVERY following operation for peritonitis resulting from the escape of matter from the digestive tract is daily becoming more frequent. As in perforation resulting from typhoid or tubercular ulceration, so in cases of traumatic rupture are our statistics becoming more and more encouraging.

In 1887, Curtis, in an exhaustive essay on this subject, including experiments on anæsthetized dogs and on the cadaver, was able to show that such rupture occurred in the vast majority of cases through crushing the bowels against the vertebral column. Curtis also analyzed 116 cases pathologically, but was able to report no cases of successful laparotomy and repair or recovery. In 1888, Mr. Croft, before the Clinical Society of London, reported a case where he had been able to prolong life for one month through making an artificial anus at point of rupture. This patient eventually died of exhaustion, being unable to stand the shock of the operation undertaken to close the opening. In 1890, however, the same surgeon was able to report the first case of recovery, and collected fourteen cases of operation undertaken with this object. From this time the cases of recovery came even more frequently, and by 1894, Mr. Battle, of St. Thomas's, was able to collect 15 further cases of operation with 9 recoveries. Since then, up to the end of 1904, I have been able to collect 12 recoveries from English and American literature, while the French yields 11 (out of 26 operations) and the German 9 (out of 32 operations),Gage, in 1902, was able to collect 85 cases of rupture of bowel occurring since 1887, or since the previous large collection by Curtis. In 40 of these operations

TABLE OF CASES OF RUPTURED INTESTINES OR MESENTERY TREATED IN THE WARDS OF THE MONTREAL GENERAL HOSPITAL DURING THE PERIOD 1895–1905.

ALL CASES WERE MALES.

Date.	Age.	Cause.	External Symptoms.	Main Symptoms.	Operation.	Post Trauma.	Lesions Present.	Result.	Cause of Death.
1898.	30	Collision on bicycle.	Bruise and hæmatoma.	Temperature 97° F.; pulse 104. Shock. Constitutional signs of hæmorrhage; vomiting; dulness in flanks.	Laparotomy and suture.	3 hours.	Ruptured small bowel, mesentery, superior mesenteric artery.	Death 5 hours; post trauma.	Hæmorrhage.
1899.	36	Kick from a horse.	Slight excoriation.	Temperature 96° F.; pulse, 72 (rapidly rising); unconscious; pain and tenderness. Rigidity of recti; tympany with dulness in flanks; vomiting.	Laparotomy and suture.	20 hours.	Ruptured small bowel and omentum.	Died 30 hours; post trauma.	Peritonitis.
1899.	48	Kick from a man; was admitted 36 hours post trauma, and would not consent to immediate operation.	None.	Temperature 99⅘°F.; pulse 100 36 hours post trauma; signs of general peritonitis.	Laparatomy and suture.	40 hours.	Ruptured ileum.	Died 84 hours; post trauma.	Peritonitis.
1902.	32	Fell 40 feet on back and side.	None.	Pain.	None.	.....	Ruptured mesentery.	Died 9 hours; post trauma.	Hæmorrhage.
1903.	50	Struck with knotted rope.	Bruise.	Temperature 96° F.; pulse uncountable; shock; pain.	None.	.....	Ruptured stomach, jejunum, liver.	Died 1 hour; post trauma.	Hæmorrhage and shock.
1904.	20	Kick by horse.	.....	Temperature 100⅘° F.; pulse 90; unconscious; vomiting; dulness in flanks.	Laparotomy and suture.	36 hours.	Ruptured jejunum.	Died 60 hours; post trauma.	Peritonitis.
1904.	56	Fall with timbers and machinery.	.....	Temperature 98° F.; pulse 90. 18 hours post trauma; pain.	None.	.....	Ruptured intestine (complete), mesentery; urethra; fractured femora.	Died 24 hours.	Hæmorrhage.
1905.	48	Lifting heavy weight.	None.	Temperature 96° F.; pulse 84 (rising); pain; rigidity.	Laparotomy and suture.	6 hours.	Ruptured ileum, mesentery.	Recovery.	.....

had been performed and in 17 recovery took place. Such figures are, however, at best misleading. Few report their unsuccessful cases, and many are diagnosed only postmortem, so that the percentage of recoveries falls much lower when compared with the post-mortem records of the various clinics whence they are reported.

In an analysis of 2443 autopsies which have been performed at the Montreal General Hospital since 1883, a period of twenty-two years, rupture of one or more abdominal viscera had taken place in 53; 63 organs being injured, spleen, 18 times; liver, 15; small bowel, 10; bladder, 12; left kidney, 5; right kidney, 2 pancreas, 1. Up to the present time 10 cases of ruptured small bowel have occurred, and all have proved fatal with present exception. This would give us a percentage of 9.09 per cent. recovery, which, though likely also to prove incorrect, must be nearer the mark than the 42 per cent. quoted by Gage, and which corresponds closely with Riegner's figures from the Allerheiligen Hospital zu Breslau where, out of 12 cases, 1 recovered from operation. (Cases dated from 1893.)

Strangely enough, eight of our cases have occurred within the last ten years, or in 13,060 surgical admissions figures which are more nearly correct for centres where a large emergency service is to be found. In five of these operation was performed with recovery or 12½ per cent. (see Table).

The following case is of interest both on account of his recovery, and more especially on account of the manner in which the lesion took place. I wish here to express my thanks to Dr. J. Alex. Hutchison, of this hospital, in whose wards the case occurred, and through whose courtesy I was enabled to carry out operation and treatment.

L. M., aged forty-eight years, an Arab, had always been well, but several weeks previous to admission had thought he might be "ruptured." Had in consequence visited a drugstore and bought a truss, which he has since worn. He never noticed a swelling in this region, and had no confirmation of his idea save that of the drug clerk and the fact that at times he felt uncom-

fortable in the inguinal region. Shortly after a moderate meal on April 19, 1905, he returned to work baling cotton. His companions being otherwise engaged, he attempted to lift a bale, weighing some 200 odd pounds, by himself. As he strained to lift, he had a sudden severe pain in abdomen, and was obliged to lie down at once, crying out on account of pain. The pain continued, and after a few minutes he was conveyed to the hospital in an ambulance. The ambulance surgeon thought a swelling in the right groin was present, but could not confirm it, but on arrival at hospital no hernia was present. At this time, three-quarters hour post trauma, the temperature was $96^{2}/_{5}$° F.; pulse, 84. Patient was perfectly quiet and rational, but excited and anxious on account of the pain, which continued severe.

On examination nothing positive was discovered save a tenseness of the recti abdominis. He was kept under observation for four hours, during which period his temperature rose to 103° F. and his pulse to 104. The pain, now accompanied by slight tenderness, continued, as did the muscle spasm; indefinite dulness in right flank. The patient vomited once. On these signs, a diagnosis of "peritonitis" was made, "probably due to a rupture of the bowel."

The patient was prepared, and under ether anæsthesia the abdomen was opened below the umbilicus in the median line. A peritonitis most marked in the right lower quadrant of the abdomen was present. On exploring the internal ring of the right inguinal canal this was found enlarged, and a sac present, but no contents. The bowel in this neighborhood was first examined, and here a rupture in the long axis of the gut, large enough to admit a lead-pencil, with everted mucosa, was found. In the mesentery underlying this loop was a transverse tear two and one-half inches long. The contents of the bowel had escaped and were escaping; a moderate quantity of blood-clot was present; though all active hæmorrhage had nearly ceased. No sign of strangulation, bruising, or injury other than the above tears could be discovered. The rupture was closed with two purse-string followed by a layer of straight Lembert sutures, the abdomen flushed out with large quantities of warm saline solution, and closed without drainage. The patient made a recovery interrupted only by a slight superficial infection. The rupture was determined to be about the centre of the ileum.

Recovery was due, I feel, to early operation, and to the fact that it was not necessary to make a prolonged search for the rupture. The fact that a second rupture was not present was evidenced by the peritonitis being confined to the half-dozen loops of bowel in the neighborhood of the lesion found. Cultures taken at operation, although from escaped intestinal contents, showed, for some unknown reason, no growth.

Von Mikulicz and Kausch refer to rupture of the bowel through much strain—"sehr heftige Anspannung der Bauchmuskeln," and Mr. Thomas, in the *British Medical Journal,* 1894, reports a case occurring apparently from simply lifting a chair; but so far as I have been enabled to learn, these cases are rarely diagnosed ante-mortem, and no reported case so occurring has recovered. Bunge, of Königsberg, at the last Surgical Congress in Berlin, April, 1904, called attention to this variety, and reports a case not dissimilar to the above, as well as one resulting from a fall on a flat, smooth surface, the injuring force being thus similar in both. He has brought forward for the first time the importance of a hernia being present in these cases, and one can readily conceive that, when contents are present in a hernial sac the free movements of the bowels may be interfered with, allowing a less active force an opportunity for inflicting damage usually caused, as has been repeatedly demonstrated, by a force of small dimensions travelling with high velocity, *e.g.,* a kick from a horse.

A diagnosis in this case was reached through an interpretation of no one symptom, but of the symptom-complex, which includes, briefly expressed, signs of shock, gas, fluid, inflammation in the peritoneal cavity, mainly, however, through the severe initial pain, which continued, and especially to muscular rigidity which also continued. This latter fact is important, as it is not infrequent to find cases, which have sustained abdominal blows exhibit a tenseness of the abdominal muscles shortly after injury, which, however, disappears within an hour or so. It has been our habit here to trust much to this sign in all cases where solution of continuity of the gut comes in question, and, though undoubtedly sometimes at fault, more

especially in cases of typhoid perforation, yet no sign deserves precedence. French surgeons have perhaps insisted on this more than those of other nationalities. Hartman reports 37 cases *contusio abdominis,* in 17 of which this sign was present, and in all these rupture was demonstrated. Peritonitis should be well started in six hours, and, except in cases where leakage is directly into the pelvis, much may be trusted to this sign. Vomiting is an invaluable adjunct, but too often long delayed.

This adds, I venture to hope, another grain to the scale of professional opinion in favor of early operation. Petry, in 1886, reported that of 160 cases of rupture into small bowel, 11 got well, 10 with abscess formation, and cases are recorded which have lived some time (three weeks) postoperative, and died from secondary perforation of abscess, but among surgeons to-day the question is but one of time when to operate. Shock is a serious drawback, no doubt; but much of its terrors are overcome by the use of ether anæthesia. Peritonitis and hæmorrhage are more serious items. A review of literature dealing with this subject affords us a striking instance of advance in abdominal surgery, and, in view of recent increase in reported recoveries, yields us, I trust, a not unwarrantable satisfaction of *erga facta pro bono humano.*

CASES OF RECOVERY SINCE 1894.

KNAGG. British Medical Journal, 1904, 832, 1 recovery.

MACDONALD. Albany Medical Annals, 1897, 1 recovery.

BUCHANAN. ANNALS OF SURGERY, 1900, 1 recovery.

LUND, NICHOLS, and BOTTOMLEY. Boston Medical and Surgical Journal, 1902, cxlvii, 584, 4 recoveries.

ELLIOT. ANNALS OF SURGERY, 1901, 34, 293, 1 recovery.

WIGGIN. New York Medical Journal, 1894, 1 recovery.

WALSHAM. Lancet, 1899, 1 recovery.

WATSON. American Journal Surgery and Gynæcology, St. Louis, 1897–8, 1 recovery.

SCUDDER. Boston Medical and Surgical Journal, 1 recovery.

CAHIER. Societe de Chir. de Paris, 1902, 1 recovery.

GUINARD. Revue de Chir., 1897, 3 recoveries.

REOBLANC. Ibid., 1897, 1 recovery.

Le Dentu. Ibid., 1897, 3 recoveries.

Societe de Chir. de Paris, 1899, 3 recoveries.

Kirslein. Deutsche Zeitschrift für Chirurgie, 1900, 8 recoveries (up to 1900).

Riegner. Deutsche Zeitschrift für Chirurgie, 1902, 1 recovery.

Thirty-two in all, to which undoubtedly there are uncollected cases to be added.

BIBLIOGRAPHY.

Farquhar Curtis. American Journal Medical Sciences. October, 1887.
Croft. Clinic Society Transactions, 1890.
Battle. Lancet, vol. i, 1894, p. 1121.
Thomas. British Medical Journal, vol. i, 1894, 1355.
Lawford Knagg. British Medical Journal, 1904, 832.
Kirstein and v. Eiselsberg. Deutsche Zeitschrift für Chir., 1900.
Riegner. Ibid., 1903.
Petry. Beitrage zur klin. Chir., xvi.
Cahier. Revue de Chir., Paris, 1902.
Societe de Chir. de Paris, 1899.
Revue de Chir., Congrès Français, 1897.
Collier. Lancet, 1888.
Gage. Annals of Surgery, vol. xxxv.
Bunge. Deutsche Gesellschaft für Chirurgie, Zentralblatt für Chirurgie, 1904.
Jacobson and Stewart. Operative Surgery, 1902.
Handbuch der praktischen Chirurgie, Band iii, von Mikulicz and Kausch.
Parker. Annals of Surgery, 1893.

THE MANAGEMENT OF CERTAIN CRITICAL CASES OF INTESTINAL OBSTRUCTION, WITH REPORT OF CASES.[1]

A. RESECTION FOR CANCEROUS OBSTRUCTION; B. RESECTION FOR GANGRENOUS INTUSSUSCEPTION; C. RESECTION FOR GANGRENE DUE TO MESENTERIC THROMBOSIS.

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For several years now, since the perfection of the technique of intestinal anastomosis, surgeons have been much disappointed at the results of resection in certain critical cases of intestinal obstruction, and especially in cases of obstruction due to cancer of the intestine. It is well known that the mortality of these operations under the prevalent method of enterectomy with immediate suture is 50 per cent. at least in the hands of the best surgeons, and in some hospitals is as high as 85 per cent. In cases of resection for gangrene of the intestine the mortality is even higher. The principal cause of death has been septic peritonitis, due sometimes to contamination by intestinal contents at the operation, but more often to the fact that the most perfectly placed sutures or mechanical devices do not hold. It is hardly necessary to say that the giving way of the suture in these cases is due to the diseased condition of the bowel.

The obstruction caused by cancer is gradual, and a diagnosis is often not made for two or three months, when the obstruction becomes complete. The bowel has then become dilated and hypertrophied, the patient has been weakened by malnutrition and has become cachectic. When such an intestine is opened, its walls are œdematous and often three or four times the normal thickness; and the contents are especially septic. When this tissue is included in a stitch it rapidly shrinks, leaving the stitch loose and leaking. If the stitch holds at first the peristalsis may be violent, or sometimes we have complete atony, both conditions may prevent union. In

[1] Read before the American Surgical Association, July, 1905.

short, the whole situation is most unfavorable for the union of the cut ends; moreover, the relief of the obstruction is of more immediate importance than the removal of the disease.

Enterectomy with a temporary artificial anus was advocated by Reichel and urged by Treves in 1883. More recently, Mikulicz and others have operated in two sittings for malignant growths of the large intestine.

We have always believed that the mortality in these cases ought to be nearer 10 per cent. than 50 per cent., and, having found every form of suture and mechanical appliance unreliable, have for several years now been doing these operations in two sittings, with most satisfactory results. Now that the technique has been improved, we think that enterectomy, with a temporary artificial anus, should be the operation of choice in all critical cases of intestinal obstruction where there is an opportunity for resection, whether it be in the large or the small intestine. Treves and others have objected to leaving a fæcal fistula in the small intestine on account of the malnutrition caused by the loss of the undigested discharges from the upper bowel. I have overcome this difficulty in two cases (one here reported, the other in the ANNALS OF SURGERY, January, 1895), in which I resected a part of the small intestine, by collecting the discharge from the upper opening and injecting it into the lower opening. I have also improved the technique of the operation by stitching the open ends of the bowel together on the mesenteric side before they are fastened into the parietal wound. This greatly facilitates the closing of the artificial anus. We have never had a death from closing an artificial anus, though it has occasionally required more than one operation. It is a safe operation, and usually hardly disturbs the convalescence.

If the patient is in too critical a condition to risk primary resection, an artificial anus may be made in the distended bowel and the diseased portion resected at a later operation if an opportunity arises. This method is to be condemned except in cases of grave necessity, because at the second operation the peritoneal cavity is opened in the presence of a fæcal fistula; also the disease, perhaps malignant, has been allowed

a longer time to develop, and it is always difficult to get such patients into good condition for a severe second operation. In using this method in an unfortunate case, at the second operation done one month after opening the bowel, we found the bowel for some distance from the malignant growth degenerated and friable, so that the stitches did not hold.

According to Hochenegg's method, the diseased intestine is freed and the mesenteric glands removed. The coil is then brought out of the abdomen and held in position by a fold of iodoform gauze passed through the mesentery. The abdominal wound is closed around the bowel. A few hours later he opens the distended intestine and inserts a glass tube. At the end of twelve days the diseased intestine is removed and the cut ends united and returned into the abdomen. This method is to be commended in that it effectually insures the peritoneum against contamination; but we can see no advantage in leaving the disease for twelve days in the outer wound. It seems equally safe to resect at once.

McGraw dissects the tumor free with the glands, then the two limbs of the intestine leading to and from the tumor are joined together by Lembert sutures, and an anastomosis made with an elastic ligature. The abdomen is then closed, leaving the anastomosis inside and the tumor protruding outside. The tumor is then cut away, and the afferent portion of the intestine is drained until the elastic ligature makes an anastomosis above the resection. This is certainly a most ingenious operation, but it is open to criticism, that its safety rests in the ability to prevent leaking about the elastic ligature and sutures placed in diseased intestinal wall, which is the same objection we are raising against resection with immediate suture.

The simplest method seems to us to be the best. Enucleate the tumor and remove the glands. When the tumor is free, draw the loop of intestine out through the abdominal wound. Wall off the peritoneal cavity with gauze. Clamp the lower efferent bowel and cut it off. Unite the mesenteric sides of the afferent and efferent bowel to facilitate the closing of the artificial anus. Stitch the upper and lower bowel to the peri-

toneal surface. Close the wound about the ends of the intestines as much as possible, then clamp the upper distended bowel and cut away the tumor. Pack the wound with gauze. The clamp on the upper distended bowel can then be removed with certainty that the peritoneal cavity will not be infected by the fæcal discharge; or, still better, if the symptoms are not urgent, the clamp may be left in place for several hours until the newly adjusted surfaces have been settled into place and have possibly begun to glue together, as in the first case here reported. The important point is not to open the upper distended bowel until the peritoneal cavity is closed.

In all these cases it is important to wash out the stomach before the operation and leave it empty, as there is great danger of regurgitation in the trachea under ether, due to handling the distended intestine.

CASE I.—*Cancerous Obstruction.*—Patient was seen June 26, 1904, in consultation with Dr. Baldwin, of Brookline. A very robust man, thirty-five years old, apparently in perfect health, who had not been able to have a movement of the bowels for six days. He had been constipated for the past six months, but had never seen blood or pus in the stools. There was no pain or vomiting except from cathartics. There was slight tenderness near the umbilicus. No distention, no rise in temperature. During the 26th, 27th, and 28th we tried opium, castor oil, calomel, and enemata without avail, little or no food being given. Only about a quart of water could be forced into the rectum. Operation, June 29. A median incision revealed a hard, puckering, annular growth constricting the sigmoid flexure. The adjacent bowel was freed from its attachments, taking as much mesentery as possible, and raised into the abdominal wound. No affected glands were found. The peritoneal cavity was walled off with gauze, and a ligature placed around the bowel just below the growth. The bowel was then cut above the ligature, and the lower (efferent) gut stitched into the lower part of the wound. The growth, wrapped in gauze to avoid peritoneal contamination, was raised to facilitate further dissection. The mesenteries of the efferent and afferent intestines being stitched together (to facilitate the later closing of the artificial anus) and the abdominal wound completely closed about the intestinal ends, a ligature was then put

around the distended afferent gut, the wound surface completely covered with gauze, and the tumor cut away. This ligature was not removed from the distended gut until several hours later, when the gauze dressing had become well glued to the entire wound surface. The patient was much relieved by the operation, and having no bad symptoms soon recovered his normal appetite. The gauze in the wound was constantly stained with fæces, and was gradually cut away as fast as it loosened, leaving a bright granulating wound. Some of the last pieces of gauze removed from the region near the fæcal fistula were seen to be white on the surface next to wound, showing that the fæcal discharge had been effectually kept from the deeper part of wound surface by the gauze dressing.

The granulations were bright after the gauze was removed, and the wound healed rapidly. In September the open ends of the bowel had become perfectly united to the skin, no granulations remaining.

Dr. Whitney, pathologist, reported as follows: "The specimen consisted of a piece of intestine about 6 centimetres in length, the greater part of which was occupied by a deeply ulcerated infiltrating new growth, leaving only a small margin of sound tissue at each end.

"Microscopic examination showed a new growth of irregular tubular glands infiltrating the entire thickness of the muscular coats at the central part and on the ends, with a growth into the submucous tissue only.

"*Diagnosis*—Adenocarcinoma."

Second operation, September 30. The ends of the gut were freed from the scar and united by an end-to-end anastomosis. Recovery was uneventful except for a small infarction which took place in the right lung on about the eighth day. The patient is now (more than a year after the operation) perfectly well and working as usual.

Case II.—*Gangrenous Intussusception.*—The patient, a man thirty-eight years old, entered the accident room of the Massachusetts General Hospital on May 20, 1904. He had been perfectly well until two weeks before entrance, then he began to have ten or twelve movements of the bowels per day, with constant pain in the left side of abdomen. At times the pain would disappear for a few moments, only to reappear. Vomited considerably during this period and retained but little food; lost weight. Had not vomited blood or passed it per rectum.

The abdomen was moderately distended, and there was considerable muscular spasm. On the left side, running into the flank, an oval tumor was visible about on level of umbilicus, which seemed to move up and down with peristalsis. The tumor was firm but indentable, with an indefinite outline. Rectal examination negative.

May 21. Under free catharsis and enemata, the distended abdomen came down considerably. Stools not remarkable. Mass situated between umbilicus and tip of ninth rib on left side. When the large intestine was distended with water, the position of the mass was not changed. No gurgling through intestine or under the tumor. Intestinal peristalsis distinctly visible.

Operation.—Six-inch incision through left rectus about on level with umbilicus revealed the colon much swollen, red, and œdematous, forming a sausage-shaped tumor of elastic consistency eight inches long. The colon was opened by a longitudinal cut, and a large gangrenous intussusception removed from the inside of the colon, the mesenteric vessels being tied inside the colon. As the opening into the upper colon where the intussusception had been cut away seemed too small, the cut ends of the gut were pulled apart and stitched into the parietal wound, the longitudinal opening in the descending colon having been closed with a running suture. A glass drainage-tube was tied into the proximal opening to carry away the fæces. The patient made a slow but uneventful recovery. The tube sloughed out in the second day and the bowel retracted into the wound.

The artificial anus was almost closed at an operation done three weeks after the first. A very small opening still remaining was closed by Dr. Scudder, who had charge of the wards at that time, a month later. The patient was in good health a year later.

Resection of a gangrenous intussusception with immediate suture is extremely dangerous, the mortality being about 85 per cent. Mikulicz has done a very ingenious operation for this condition. He first stitches the enlarged distended colon into the parietal wound, thus completely excluding the exposed colon from the peritoneal cavity. He then opens the anterior wall of the colon thus excluded, and removes the gangrenous intussusception thus exposed by cutting away the outer and inner layers of the intussusception and closing the cut edges by deep catgut sutures, so that the peritoneal cavity is not opened when it is

cut away. He then leaves the opening in the colon as an artificial anus, which is closed several weeks later.

Mikulicz has done two cases by this method with good results. So I think we have in Mikulicz's operation perhaps the best operation for the removal of a gangrenous intussusception. But when this operation is unadvisable, stitching the cut ends of intestine into the wound is the safest method.

CASE III.—*Resection for Gangrene due to Thrombosis of the Mesenteric Artery.*—The patient, a man twenty-two years old, entered the Massachusetts General Hospital, April 7, 1904, with the diagnosis of a duodenal or peptic ulcer. He had had gonorrhœa and syphilis, but no secondary symptoms. He had felt perfectly well until three weeks before entrance, when he began to have pain in epigastrium and vomiting. He had a good appetite, but vomited three or four times a day; the vomitus often had a "coffee-grounds" appearance, but he had never vomited fresh blood. He had lost eighteen pounds in weight.

While in the hospital his symptoms and distress increased, and he finally vomited some fresh blood.

Operation.—On April 14, an anterior gastrojejunostomy was made with a bone bobbin. There was no evidence of disease of the stomach or pylorus. The stomach was not dilated. The small intestine was noted to be thin and friable when stitched and rather dark in color. The patient did well, and got early relief from the operation. He had a good appetite, retained and digested his food. On May 2 he complained of a pain in his abdomen, which soon passed away. May 3 he was seized with more severe abdominal cramp-like pain, with nausea and vomiting. The abdomen was soft, and a rounded mass was distinctly felt opposite the umbilicus on the left side. No result from the enemata. May 4 pain more severe; pulse, 120; abdomen swollen and tympanitic, so that tumor could scarcely be detected.

Operation.—Incision in linea semilunaris; small amount of cloudy fluid. A coil of distended and almost black small intestine lay directly beneath incision, with neighboring coils slightly adhering to each other, and a little fibrin on them. The mesentery was black almost to its root. A careful examination showed no constricting band and no sign that the coil had been twisted. The coil was delivered while the peritoneal cavity was "walled off" with gauze, and fourteen inches found to be gangrenous with a foul odor. About an inch beyond the gangrenous area, on an

otherwise healthy part of the gut, was a small dark spot showing another centre of the same process. The affected coil was cut away between two clamps. No fæcal discharge was visible. The open ends of the intestine were now sutured to the parietal peritoneum, and the mesenteric borders were stitched together, thus keeping the ends together in order to facilitate a subsequent operation for closing the necessarily resulting artificial anus.

The patient made a prompt recovery. In a few days the skin became irritated by the acrid discharge from the artificial anus, and he began to show the want of proper nutrition. We judged from this that the excised coil must have been high up in the small intestine, a fact not accurately determined at the operation on account of the critical condition of the patient.

The skin around the artificial anus was protected with ointment and nutritious materials were injected into the open bowel; finally, we devised a system of collecting the partially digested material discharged from the upper bowel and injecting it into the lower end with a soft catheter. The patient was slightly inclined on one side, and the discharge was caught in a glass pus basin. The discharge was periodic and often quite thick. It was injected into the lower gut about five minutes after it came from the upper opening when the intestine became quiet. It was forced through a soft catheter with a hard rubber syringe. It had to be given very slowly to be retained, one-half ounce or so at a time, with brief intervals, until the whole discharge had been returned. In this way his nutrition was greatly improved.

The artificial anus was closed by Dr. Scudder on June 9, as my term of service had expired at that time. He was discharged July 14, having gained sixteen pounds, and is perfectly well to-day, more than a year after the operation.

The following is a quotation from the pathological report of Dr. G. H. Wright:

"It is of a black-red color, and at least twice as wide in diameter as normal, the peritoneal surface showing some fibrous thickening. On section the entire wall of the intestine is densely infiltrated with blackish, opaque, thick fluid. The same fluid is found in abundance in the lumen of the intestine. The mucous membrane in general is of a blackish, moist appearance, with no definite ulcerations. The portion of the mesentery adherent to the intestine is markedly infiltrated with black, thick fluid." . . . .

"Microscopic examination of pieces of the mesentery attached to the intestine show thrombosis of good-sized veins, but none of the arteries."

In this case I have not been able to understand why the thrombosis of the mesenteric vessels followed the operation of gastro-enterostomy, but I feel certain that the gangrene was due to the thrombosis.

In the ANNALS OF SURGERY, January, 1895, I reported a case of resection of four feet of gangrenous intestine due to thrombosis of the mesenteric veins. In this case I stitched the open ends of the intestine into the wound as described above. This was the first successful case ever recorded of resection for gangrene due to mesenteric thrombosis. Since then, according to Jackson, Porter, and Quimby, who have collected all the cases up to 1904, there have been three other successful cases. They are as follows:

GORDON. Resection of two feet of intestine and end-to-end suture over a bobbin. Intestine leaked into dressing five days after operation. Wound opened and packed, and in two days a slough came away, representing the entire suture line. Resulting fæcal fistula closed in two weeks. Recovery.

KOBLING. Intestine resected and lower end of duodenum sewed up (because it was too short for anastomosis), and upper end of jejunum joined to stomach by anterior gastro-enterostomy. Much distention and vomiting followed with right parotitis, fever, and œdema; but patient finally recovered.

SPRENGEL. Ten centimetres of small intestine gangrenous, and was excised and ends left in the wound. Peritoneal cavity drained. Good convalescence. Fæcal fistula closed five weeks later with end-to-end suture. Recovery.

From this we see that five cases have recovered, one by Gordon, one by Kölbing, one by Sprengel, the other two done by myself; a mortality of 97 per cent. according to Jackson, Porter, and Quimby. Of these, three uninterrupted recoveries were operated on in two sittings, the resected ends being left open at the first operation; while Gordon's case, where end-to-end suture was used, only recovered after the sloughing out of the entire suture line. This leaves Kölbing's case the

only one in which immediate suture has acted even fairly well. We think it is therefore evident that resection in two sittings has so far proved the most satisfactory method in resections of gangrenous intestine due to thrombosis of the mesenteric artery.

Summary.—1. We find the prevalent method of enterectomy with immediate suture in cases of intestinal obstruction attended with a high mortality due to the changed condition of the distended bowel.

2. Enterostomy with later enterectomy is to be reserved for the cases unable to bear primary enterectomy.

3. Enterectomy with a temporary artificial anus should be the operation of choice in all critical cases of intestinal obstruction, where there is an opportunity for resection, whether it involves the large or the small intestine.

4. The suggested improvements in the technique are as follows:

The upper distended bowel should not be opened until the peritoneal cavity is completely closed. (This is already the practice of several surgeons.)

The open ends of the bowel should be stitched together on their mesenteric side before they are fastened into the parietal wound. This will greatly facilitate the later closing of the artificial anus.

When the artificial anus is in the small intestine, the partially digested discharge from the upper opening should be collected and injected into the efferent opening.

5. The closing of the artificial anus is a safe operation, and hardly disturbs the convalescence.

6. Up to the present time not enough cases have been done by this method to estimate its relative mortality, but the cases here reported, with those referred to, suggest the probability of better results than have been obtained by enterectomy with immediate suture.

ANGULATION AT THE SIGMOID.

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ANGULATION of the intestinal canal at the sigmoid is a pathological condition which we believe exists, but has not been described. The chief symptom of this condition is intestinal obstruction, and those of advanced years seem to be most liable to be affected.

By angulation *at* the sigmoid, we mean that the intestine is so bent upon itself, at either the upper or lower end of the sigmoid, that complete or partial obstruction to the passage of the fæcal current is established.

The sigmoid is firmly attached at both its proximal and distal ends, the descending colon above is quite freely movable, and the sigmoid itself is loosely attached. This permits the portion of bowel immediately above the point of firm attachment to drop down, and so draw on the firmly attached portion that an angulation results.

That this condition does actually occur, we believe is proven by the post-mortem recorded in our series of cases. These cases so closely resemble cases of volvulus that it is only natural that the question of diagnosis should be raised. Are not the cases here presented cases of volvulus? We believe not, for it seems hardly possible that a twisting of the mesentery, such as would necessarily accompany volvulus, could exist for so long a period as three weeks without causing either gangrene of the gut or a profuse exudation of serum in the peritoneal cavity. Neither of these existed in our cases.

Cases which have been diagnosed as volvulus may in many instances, we believe, really have been cases of angulation, for in not all is the condition actually seen. An operator makes the diagnosis of volvulus, opens the abdomen, and during the

manipulations, while approaching the suspected seat of trouble, hears a sudden gurgle and the intestinal contents pass on. Naturally, he feels he has released the twisted coil and that the diagnosis is confirmed. Would it not be more reasonable to believe that an angulation would so be overcome than that a twist would be undone?

Dr. Emil Reis (ANNALS OF SURGERY, October, 1904), in a very interesting article entitled "Mesosigmoiditis, and Its Relation to Recurrent Volvulus of the Sigmoid Flexure," relates the history of a case, and describes the conditions found during the operation. He says:

"The sigmoid was not twisted when the abdomen was opened, but a slight impulse given to the upper half of it sufficed to make it drop upon the lower half." From this description we can see no direct evidence in this case; the anatomical condition described was nearer an angulation, although by manipulation it could be converted into a volvulus.

Angulation at the sigmoid may occur at either its proximal or distal end, as these points are comparatively fixed by a short mesentery. In the one case the sigmoid is empty, as shown by the autopsy, to be recorded, and in the cases where the angulation is at the lower end the sigmoid is dilated. This was probably the condition in Case I, although before operation the symptoms and examination pointed to a probable intussusception. That this was not the cause was shown at the operation.

CASE I.—Mrs. B., aged forty-nine years, was admitted to the Methodist Episcopal Hospital in the service of Dr. George R. Fowler, with the following history: Patient had been a healthy woman; family history negative; four days ago, without apparent cause, she began to feel a discomfort in the abdomen, associated with constipation. While stooping forward she had a sharp pain in the middle of the back and lumbar region. Patient was given cathartics and enemata. The latter at first brought away a few small particles of fæcal matter. Meteorism progressed until the belly became greatly distended. During twenty-four hours before admission, vomiting appeared, but was not stercoraceous. There

had been a good deal of abdominal pain. Rectal examination revealed high up in the rectum a ridge, which was taken to be the end of an intussuscepted intestine. No tumor could be made out.

Operation through a median incision failed to disclose any tumor mass. The entire intestinal tract was greatly distended, the cæcum reaching nearly the median line. The median wound was closed, a second incision made in the right inguinal region, and the cæcum lifted into it was there sutured so as to produce an artificial anus. There was some discharge of fæces and gas immediately, but not any great quantity for thirty-six hours. The next morning, after the free discharge from the artificial anus, there was a free normal rectal movement. After this very large amounts were passed per rectum. The case progressed favorably, and on October 23 the artificial anus was closed. The patient made a good recovery. On account of the general laxity of the abdominal wall, patient was advised to continuously wear an abdominal bandage. This she did not do.

After her discharge from the hospital, she went about her work, and for some time suffered no discomfort, but later a ventral hernia developed at the site of the artificial anus. I saw her on several occasions when signs of strangulation were present, but was able to reduce the mass. On one occasion, three years later, this became strangulated and irreducible, and operation was undertaken. The intestines were firmly matted together in the sac, and it was with great difficulty that the mass was reduced and the operation completed. At the time, examination failed to reveal anything in the abdomen to account for the previous obstruction.

Case II.—This case was presented in the person of Mrs. H., sixty-two years old, who was seen in consultation with the late Dr. Bowser. The history was of complete obstipation for three weeks. For a number of years she suffered with constipation, and for this continually took cathartics. During the three weeks no movement was obtained from the use of frequently repeated enemata and the administration of cathartics. During this time there had been a very general increase in distention and no vomiting until the day of examination. On examination we found a greatly distended abdomen, especially in the lateral parts. The patient was very weak and pulse feeble and rapid; no tenderness

over the abdomen, and at no point could a tumor or sense of resistance be felt. She was removed to St. John's Hospital, and under cocaine anæsthesia a right lateral colostomy done, using the cæcum, which was greatly distended. The bowel was brought through the muscle and sutured, by a number of silk sutures, to the skin. An immediate opening was effected; this gave rise to a profuse discharge of liquid fæces, which continued almost without interruption for two days. At the end of eight hours, much to our surprise, she had a normal evacuation of the bowels. From this time on, at irregular intervals, the discharges from the artificial anus were supplemented by normal bowel movements. She made a good recovery and went to her home. Nothing was heard from her until February, 1899, when she came complaining of a prolapse of the bowel at the artificial anus. This could easily be reduced. Operation for the closure of the opening was advised and refused. On the morning of May 19 following, I was summoned to her home, and found that the prolapse had recurred and that it could not be reduced. The cæcum had herniated through the opening made in it for the artificial anus, and in the parts projecting, the openings of the appendix and ileocæcal valve could be plainly seen; in fact, it was an intussusception passing out through the artificial anus. The parts had become so swollen and œdematous that reduction was impossible. Operation was now consented to, and she was removed to the Norwegian Hospital and the following operation performed: An elliptical incision was made about the opening, including about a half-inch of normal skin. This was carried through the muscle and peritoneum, and the mass entirely freed and lifted out of the abdomen. The opening in the cæcum was then enlarged so that the mass could be easily reduced. After reduction, the rent in the side of the cæcum, being the opening made for the artificial anus, was closed by silk sutures. The abdomen was then thoroughly explored for the cause of the original obstruction, and no tumor, adhesions, or band of any kind could be found. The external wound was completely closed. Healing was per primam, and a complete recovery followed, the patient continuing to have normal bowel movements.

These cases caused me to reflect on the probable cause of the obstruction, and we advanced the theory that with the advance of age and general relaxation of tissue the sigmoid

became more movable than normal, that the continued use of saline and other cathartics further relaxed the tissues and increased the amount of fluid discharge in the sigmoid. The intestine, borne down by its own weight, fell into the true pelvis and, dragging on the fixed upper end of the rectum, produced an angulation at that point. Now, as further efforts to move the bowels produced increased peristalsis from above, this angulation would only become more acute and complete. Rectal enemata failed to pass the point and only the injected fluid would return. In both cases rectal examination had failed to discover any mass, but in the upper pelvis could be felt the downward pressure of distended intestine.

This was only a theory and could not be verified.

CASE III.—In the fall of 1902, I saw, in consultation with Dr. Frank W. Shaw, a lady, seventy years of age, a constant user of saline and other cathartics for many years, who suddenly developed obstructive symptoms. She became much distended; no fever; pulse quite feeble and rapid; some nausea after the fourth day and pain at intervals, very sharp and acute, apparently from peristalsis due to castor oil, which had been freely administered. Enemata had been given with no result. The question of probable carcinoma was raised and operation considered. Having in mind the two cases above mentioned, I advised high elevation of the hips and repetition of the water enemata. This with the hope that, if the theory were correct, the distended sigmoid would be displaced by gravity from the pelvis, and that the water in the rectum would assist in overcoming the angulation. After about six hours our efforts were rewarded by a free movement from the bowel. During the next twenty-four hours the amount of fluid fæcal matter passed was astonishing. This continued for three days. The patient made a good recovery, and has had no recurrence of the trouble.

This case resembled the other two in the previous history and large discharges after the obstruction was overcome, and the result seemed to justify the diagnosis.

During the past year we believe the diagnosis has been substantiated by autopsy.

CASE IV.—Through the kindness of Dr. Archibald Murray, I am enabled to report the following case: Man, aged about seventy years, was ill with pneumonia when he developed symptoms of intestinal obstruction with fæcal vomiting. His condition from the pneumonia was so grave that operation could not be considered. At autopsy the large and small intestine were found greatly distended with fluid fæcal matter, the amount of fluid in the intestines being enormous. The descending colon, by the weight of the fluid contained, had been dragged towards the pelvis and angulated the gut at the juncture of colon and sigmoid. There was no twist or band to obstruct; it was the direct result of traction against a fixed point. The rectum and sigmoid were empty.

CASE V.—In April, 1905, a man, fifty-five years of age, was admitted to my service in the Long Island College Hospital. He gave the following history: For a number of months he had suffered from recurrent attacks of obstinate constipation, which when relieved were followed for several days by profuse fæcal discharges. He was not very intelligent, and an accurate history could not be obtained. For two weeks previous to admission he had had no movement of the bowels, appetite was lost, and flesh and strength were very much reduced. The abdomen was somewhat distended; careful examination revealed no point of tenderness and no tumor. Rectal examination revealed an empty bowel, and at about four inches above the sphincter an obstruction. To the touch this gave the impression that a stout band was drawn across the bowel at that point. The finger on removal showed no trace of blood, mucus, or fæcal matter.

Exploratory operation was performed before a class of about fifty students from the college, together with the family physician and my assistants. A diagnosis of carcinoma of the sigmoid had been made, based principally on the loss of flesh. On opening the abdomen the small intestine was found to be only partially distended, but the large intestine to the left iliac fossa was greatly dilated.

Examination failed to disclose the mass we were looking for, but did show very plainly that the cause of the obstruction was an angulation at the lower end of the sigmoid. Tracing the bowel downward from the colon it passed deeply into the pelvis

and then rose again to the point of attachment of the intestine near the ileosacral joint. At this point there was a distinct bending of the bowel upon itself, so that a complete obstruction was created, and the intestine beyond was entirely empty. This was satisfactorily demonstrated to all present.

On lifting the sigmoid from the true pelvis the contents of the gut immediately passed into the rectum. At the point of obstruction there was no band or adhesion of any sort. In the folds of the mesosigmoid, which was very long, were a number of recent adhesions. These were easily broken down. The intestine was held well out of the pelvis by my assistant, Dr. W. B. Brinsmade, while I sutured the external surface of the mesosigmoid to the parietal peritoneum covering the iliacs, by several layers of catgut sutures. The abdomen was closed. The next day a normal movement of the bowels occurred, and from then until his discharge from the hospital there was no more trouble. valescence was retarded by a sharp attack of pneumonia which developed on the second day and ran a course of seven days. He was discharged at the end of the third week much improved in general condition and with the constipation entirely overcome.

In this case we had presented a typical case of angulation which was easily and satisfactorily demonstrated to a large number of spectators.

Two other cases of obstruction, which seem to belong to this class, treated by artificial anus and given complete relief followed by natural movements of the bowel, have come under the writer's observation, but could not be followed to ultimate cure.

These cases resemble very closely cases of new growth in the large intestine, volvulus at the sigmoid, and also cases of mesosigmoiditis as described by Ries. How shall we differentiate them? In cases of carcinoma, we have the previous history of constipation and general loss of flesh and strength, with often the sudden onset of obstructive symptoms. Carcinoma of the large intestine is most apt to occur in the upper or middle segments of the rectum; by rectal examination the mass can be felt, and the withdrawal of the finger is followed by the escape of mucus and blood. In other cases the growth

is at either of the flexures of the colon, and can usually be felt or the distended intestine cannot be traced to the sigmoid.

Cases of volvulus of the sigmoid naturally give about the same symptoms and, unless very marked, would probably give way to the same treatment as indicated in cases of angulation. Where volvulus is a symptom of mesosigmoiditis, we have usually a history of repeated attacks of obstruction, and of inflammatory symptoms antedating these attacks. These patients usually suffer with backache, referred to the coccyx, or pain across the lower part of the abdomen; possibly discharges of pus and mucus from the rectum, and on rectal examination may show a diffuse infiltration of the paraproctic tissue.

In cases of angulation of the sigmoid, there can be felt by rectal examination nothing but the pressure of distended intestine above the pelvis. The rectum is empty, usually not dilated, and the withdrawal of the finger is not followed by any discharge whatever. These patients usually show no loss of flesh nor change in their general health. The symptoms sometimes come on slowly, as in Case II, or suddenly, as in Case III.

Treatment.—The use of cathartics is to be advised against until some evidence of fæcal matter in the stools is present, then the use of castor oil would seem to be the least objectionable. If the patient's condition will permit, rectal injections, with the patient practically in the knee-chest position, may be tried, and in some cases will be effective. If this fail after a few attempts, or the patient's condition is poor, operation for the production of an artificial anus, using the cæcum, is to be done. This may be performed under either local or general anæsthesia. The bowel should be immediately opened. After two or three months, if normal rectal movements have been established, the artificial opening may easily be closed.

A somewhat similar condition is described by Walzberg (*Arch. f. klin. Chir.*, Band lxvi) as occurring in the upper intestine after operations. He describes it as acute duodenojejunal intestinal obstruction. Cases following operation will

sometimes pursue a normal course, except for the continuation of vomiting for several days, or this may not occur for two or three days, when it will appear and continue, and be followed by profound prostration. Examination will reveal the area over the stomach markedly distended, the outline of the organ being visible. There is usually little or no nausea; the vomiting of large quantities of fluid occurs at long intervals and contains more or less bile. From a clear greenish color at first, it soon becomes darker until it becomes a dark brown. Autopsy in such a case showed no peritonitis. The stomach and duodenum were greatly distended and the remainder of the intestine empty, but displaced downward into the pelvis. On raising the omentum and transverse colon, the duodenum was found greatly distended above the point where it passes under the parietal attachment of the mesentery. The base of the mesentery crossed over in front of the gut in the form of a three-inch band, and was firmly held in this position by the displaced intestines. The mechanism of this condition is explained by a primary dilatation of the stomach, the atonic intestines are pressed downward, the mesentery dragged upon, and the duodenum is pinched between it and the vertebræ. These cases are best treated, according to Mayo-Robson, by frequent lavage; and if the symptoms do not subside, the patient should have the pelvis well elevated, or the patient turned on the side. In some cases the supine position may give relief. Morphine is of service, and in my hands has, I believe, saved several cases. The use of cathartics only tends to increase the pressure from above and make the condition worse.

I mention this condition with the one we have been discussing because I believe the mechanical conditions are similar, and the treatment in each case must be directed to relief of the pressure from above, and not attempt to force the contents of the upper bowel downward by cathartics.

MESOCOLIC HERNIA.

BY JOSEPH FAULKNER DOBSON, M.S.(LOND.),
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THE body from which the specimen of this rare variety of retroperitoneal hernia was obtained was that of a still-born hydrocephalic fœtus a few months short of full term. It was hardened by injecting the thoracic aorta with a 25 per cent. solution of formalin.

On opening the abdomen, turning aside the small intestines and raising the transverse colon, a hernial sac containing jejunum was brought into view.

The sac lies to the left of the duodenojejunal flexure, extending between the layers of the transverse mesocolon to the splenic flexure. The layer of peritoneum forming the posterior wall of the sac is in contact with the left kidney and suprarenal capsule, and the tail of the pancreas, while showing through the mesocolon forming the upper limit of the sac, is the greater curvature of the stomach.

In the free border of the sac can be seen the ascending branch of the left colic artery. The orifice of the sac extends quite up to the transverse colon; the artery runs in the free edge of the peritoneal fold forming the anterior wall of the sac, and does not pass into the mesocolon until it approaches close to the bowel. The mouth of the hernial sac, which looks forward and to the right, measures in length 2 centimetres, in breadth 1.5 centimetres, while the depth of the sac is 2 centimetres.

The hernia contains portions of two coils of intestine, formed by the first loops of the jejunum, which enters into the sac, passes out, then re-enters and passes out again.

Both the superior and the inferior duodenal folds and fossæ are present, and the inferior mesenteric vein can be seen lying under the posterior parietal peritoneum at some little distance from the orifice of the sac.

With the exception of the hydrocephalus, the body presented no other abnormality.

The variety of retroperitoneal hernia described above appears to be extremely rare; indeed, so rare that its very existence is unmentioned either by Treves or by Moynihan.

The former, in his Hunterian Lectures [1] and in his work on "Intestinal Obstruction," [2] states that all retroperitoneal herniæ arising in the neighborhood of the duodenum have their origin in the fossa duodenojejunalis of Treitz (inferior duodenal fossa, Jonnesco, Moynihan).

This fossa exists in a very large proportion of bodies. It is bounded in front by the inferior duodenal fold; this peritoneal fold, triangular in shape, runs from the anterior surface of the ascending limb of the duodenum to blend with the peritoneum covering the posterior abdominal wall; it is best seen by lifting aside the small intestines and gently drawing the duodenum to the right. The fossa is bounded in front by the inferior duodenal fold, to the right by the duodenum, and behind by the peritoneum covering the lumbar vertebræ; its orifice looks upward.

Sir F. Treves describes the hernial sac as extending in front of the kidney and pancreas and being more or less surrounded by the transverse and descending colon. "The vessels have the following relation to the anterior or free margin of the orifice; curving round the upper part of the border is the inferior mesenteric vein, in relation to the vein is the ascending branch of the left colic artery with its vein, the thickness and roundness of the free border are due to the large inferior mesenteric vein which it contains." [3]

In this account of the mode of origin of these herniæ, Sir F. Treves follows the description originally given by Treitz.

Of late years, the tendency to regard the inferior duodenal fossa as the seat of origin of all varieties of duodenal hernia has diminished.

Mr. Moynihan [4] divides herniæ arising in the neighborhood of the duodenum into two varieties: left duodenal hernia, of which the orifice looks to the right and the fundus of the sac to the left; and right duodenal hernia, with the orifice to the left and the fundus to the right. We may, in this place, confine our attention to left duodenal hernia.

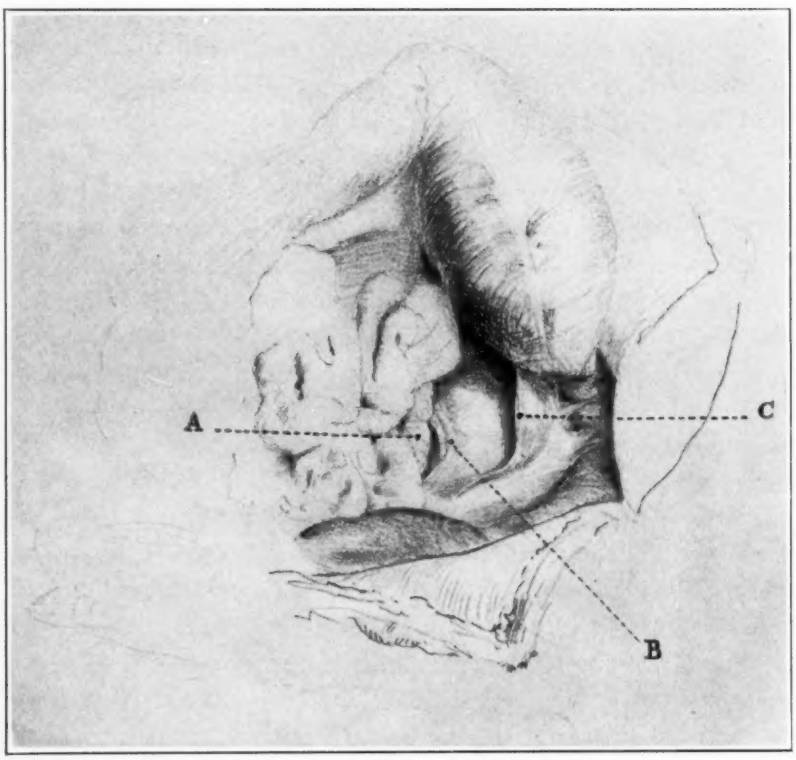

FIG. 1.—Drawing of hernia after removal of coils of jejunum from the interior of the sac. A, ascending portion of the duodenum; B, inferior mesenteric vein; C, free margin of sac containing the ascending branch of the left colic artery. (I am much indebted to Mr. M. A. Teale for this drawing of the specimen.)

These, Mr. Moynihan considers, have their origin in the paraduodenal fossa or fossa of Landzert. He describes the fossa as follows:

"It is situated to the left and some distance from the ascending limb of the duodenum. The fossa is caused by the raising up of a fold —the plica venosa—by the inferior mesenteric vein, the plica venosa consists of a vertical and a horizontal portion; the vertical being to the left of and below the fossa, and the horizontal bounding the fossa above." [5]

Mr. Moynihan states that "the orifice of a [left duodenal] hernial sac is always vascular. In the neck of such a sac can always be seen the inferior mesenteric vein; the left colic artery may be closely applied to it, or may be some little distance away, the fold containing the vein is tne plica venosa, and the fossa bounded by such fold is the paraduodenal fossa, or fossa of Landzert." [6]

Jonnesco [7] describes a fossa to which he gives the name "paraduodenal fossa," formed by a fold containing the ascending branch of the left colic artery. This semilunar fold forms the anterior boundary of the fossa, which extends to the left between the layers of the transverse mesocolon towards the splenic flexure. In Jonnesco's drawing of this fossa, the inferior mesenteric vein is depicted running under the posterior parietal peritoneum, and raising up a subsidiary fold dividing the fossa into an upper and a lower portion.

I have lately seen in a dissecting-room body a fossa similar to the one described and depicted by Jonnesco. On the under surface of the transverse mesocolon was a fold containing the ascending branch of the left colic artery, and this fold of peritoneum formed the anterior boundary of a fossa into which it was possible to insert a small coil of intestine. The value of this observation is, however, entirely negatived by the fact that there were numerous adhesions around the appendix, and in other parts of the abdominal cavity, particularly in the neighborhood of the splenic flexure and descending colon; under such circumstances it is impossible to say whether the fold was a congenital one or not.

It is preferable to restrict the term "paraduodenal fossa" to the cavity bounded by the fold containing the inferior mesenteric vein,—the fossa of Landzert.

The fossa described by Jonnesco has not been generally accepted by anatomists; but it seems that the specimen which I have described above is an example of a hernia into this fossa.

It is quite certain that this hernia did not have its origin in the inferior duodenal fossa (duodenojejunalis of Treitz), as this fossa can be observed intact in the same specimen. It is also equally certain that it did not arise in the paraduodenal fossa of Landzert, as the inferior mesenteric vein, which runs in the fold forming the margin of the fossa of Landzert, is not included in the margin of the opening into this hernial sac, but can be seen running behind the parietal peritoneum at some little distance from the orifice. We must therefore regard this hernia as belonging to a distinct and definite variety, not to be confounded with the usual form of left duodenal hernia.

The hernia which Astley Cooper [8] described and figured under the heading of "mesocolic hernia" may be an example of this variety. In the description and in the accompanying plate no mention is made of the inferior mesenteric vein, while the position of the ascending branch of the left colic artery—running in the free margin of the orifice of the sac—is clearly shown.

Had this mesocolic hernia of Astley Cooper's been an example of the ordinary form of left duodenal hernia, surely that distinguished surgeon and anatomist would not have failed to note the important position of the inferior mesenteric vein in the neck of the hernial sac.

No doubt other specimens of this variety of retroperitoneal hernia have been seen, but, so far as I have observed, in none has the exact relation of the colica-sinistra artery and the inferior mesenteric vein to the neck of the sac been described, and in none has a clear distinction been drawn between the variety under consideration and the ordinary forms of left duodenal hernia.

It is to be hoped that the origin and frequency of these herniæ may be definitely settled by the publication of all cases

observed, with especial reference to the exact relations of the colica-sinistra artery and the inferior mesenteric vein to the neck of the hernial sac.

REFERENCES.

[1] Treves. Hunterian Lectures, 1885.
[2] Treves. Intestinal Obstruction, 1899.
[3] Ibid., p. 112.
[4] Moynihan. Retroperitoneal Hernia, 1899, page 42.
[5] Ibid., page 34.
[6] Ibid., page 45.
[7] Jonnesco, in Poirier's Traité d'Anatomie Humaine, vol. iv, page 260.
[8] Astley Cooper. Crural and Umbilical Hernia, Part II, 1807.

LYMPHATIC AND HEPATIC INFECTIONS SECONDARY TO APPENDICITIS.[1]

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In considering the lymphatic and hepatic infections secondary to appendicitis, I shall not attempt to enter into the innumerable questions and problems that belong to so large a subject. But I will rather refer, in a somewhat desultory way, to the few points that have come within my own experience, in the hope that it may reawaken interest in so obscure a subject, especially on the part of the general practitioner.

Whatever views are offered here are based on a pretty general review of the literature and on a personal experience of thirty-nine cases,* all except two of which have been identified at operation or autopsy or both.

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[1] Read before the Chicago Surgical Society, April, 1905.

* Since reading this paper, we have had two additional cases of subphrenic abscess at the Carney Hospital, both of which were fatal. The first case was in a girl of eighteen, who was operated upon within twenty-four hours from the beginning of an attack of acute appendicitis. The gangrenous appendix was removed and the wound was drained. There was no infection of the peritoneum beyond the immediate region of the appendix which lay posterior to the cæcum. The mesenteriolum contained thrombi and was removed. For a few days the condition was satisfactory, when the pulse and temperature began to rise, and there was slight icterus, with definite hepatic tenderness. Exploration of the sinus showed a small abscess, posterior to the peritoneum, at the original site of the appendix. Improvement followed drainage for a week, when the symptoms of sepsis again appeared, and three weeks from the first operation a pelvic abscess, not connected with the first wound, was opened and drained. In spite of free drainage, the patient did not improve, but began to show evidence of trouble in the upper abdomen. With more definite signs as a guide, the abdomen was opened through an epigastric incision five weeks from the time of onset and a foul subphrenic abscess to the left of the median line was drained. The patient did not improve, however, but steadily became more and more septic until death three weeks later.

The second case occurred in a man thirty-seven years old, who was brought to the hospital five weeks from the beginning of an attack of appendicitis. A large subphrenic abscess over the right lobe was opened and drained through the chest wall after excision of the eighth and ninth ribs. Very little improvement resulted, and he died on the sixth day with high pulse and temperature.

With regard to these infections, I shall limit myself to the lymphatic area of the right side of the body extending upward from the cæcal to the costal region. Within this small space of the body, together with that occupied by the liver, a good share of the gravest secondary complications incident to appendiceal infection takes place.

Chvostek has given a most clear and complete exposition of the diseases of the portal system, with an extensive bibliography up to 1882. I have used his general conclusions in addition to those of Perutz, Berthelin, Grüneisen, and Abbadie, who have brought the literature more or less completely up to date. Inasmuch, however, as I find that there are certain points on which my conclusions are more or less at variance with those expressed by the authors mentioned, it has seemed to me wise to review in the original a large majority of the references, cited since the publication of Chvostek's paper. Altogether in the last few years there are something over 200 references, and it is needless to list them all. In the above-mentioned theses a fair aggregate may be found, to which additional references, mainly of isolated cases, may be added from the Index Medicus.

Broadly speaking, very little as regards infections through the portal system can be added to Chvostek's exposition. Those interested are referred to the original article in the *Wiener Klinik* for 1882.

To enter into the origin of liver abscesses of all types is a great temptation, but it would lead us too far from the class which I have chosen for discussion. In discussing the general subject once for all, suffice it for us to mention, as worthy of our consideration in a differential diagnosis, the following possible causes of a liver abscess: trauma, foreign bodies (including worms), dysentery, malaria, amœbæ, infections of the thoracic organs and of the umbilicus, pyæmia arising from various infections in any portion of the body, anthrax, ulcers of the gastro-intestinal tract, pelvic infections, splenic abscess, abscess of the mesenteric lymph-nodes, infections of the biliary tracts and pancreas, from peritonitis, echinococcus, infection after hæmorrhoidal operation, etc.

Much has been written about tropical abscess, and the general course and treatment are now well established. The infections incident to many of the conditions enumerated above are of secondary importance compared to that of the original disease. But when we come to infection following appendicitis, we are at once struck with a reversal of the condition; for we must appreciate that it is the milder, so-called latent, forms of appendiceal inflammation that may start the grave hepatic infections. It is on account of this very disproportion that I have been influenced to emphasize the importance of this subject once again.

In 1900 and again in 1902 I briefly reported a few cases that came under my observation; but the association of appendicitis with lymphatic and hepatic infections is still overlooked by those of large experience, and it is only by constant reiteration that a subject of this importance can be brought up to its true level.

In the present paper I shall not hesitate to make use of my earlier cases to illustrate certain data, even at the risk of making my own experiences unduly prominent. At the same time I shall not enumerate all of the cases that I have seen, because several of them are merely typical and do not illustrate any particular point.

The thirty-nine cases which I have observed may be divided as follows: undoubted portal infections, 15; subphrenic and portal infections, 2; probable portal infection, 1; abscess of the liver in which the pathway of infection could not be determined, 2; subphrenic abscesses, 5; retroperitoneal lymphangeitis, 14.

Subphrenic abscess, as a lesion classed by itself, has been so thoroughly elucidated by Grüneisen and others that it need not be treated in detail here. Infection of the subphrenic space from an appendicitis may take place through the lymphatics, through the direct invasion of pus travelling along the posterior cellular spaces, through direct invasion from the peritoneal cavity (as shown in the autopsy of Case No. 7 reported by Christian and Lehr in the *Boston City*

Hospital Reports for 1902), or from extension of a pre-existing liver abscess. Infection may, on the other hand, travel from the subphrenic space to the liver, forming secondary abscesses in that organ.

The abscesses coming by the extraperitoneal route, according to Sachs, can never take up the whole dome of the diaphragm. The adhesion of the peritoneum to the diaphragm is so firm that the infections appear more as phlegmons, breaking through and forming collections of pus between the liver and the diaphragm. Subphrenic abscesses may also be the remains of a general abdominal infection, the contents varying with the infection. The type of appendicitis prone to produce these abscesses, however, is that which invades the retroperitoneal tissue of the cæcal region (Grüneisen).

Sanger, injecting a solution behind the colon, found that it always passed over the right kidney and formed a large lake; at the level of the horizontal portion of the duodenum it ascended past the round edge of the liver to the diaphragm. Abscesses need not necessarily form in this pathway between the infected appendix and the terminal abscess at the diaphragm.

Bourkhardt considers that the two commoner methods of infection are (1) by the retroperitoneal tissue, and (2) by direct invasion. Grüneisen reports two left- as against twenty-seven right-sided abscesses, the former being the remains of a general purulent peritonitis; hence the probability is that a left-sided subphrenic abscess is of intraperitoneal origin. An example is seen in Christian and Lehr's case mentioned above. This occurred in a boy of eleven, who showed at autopsy general adhesion of the intestines, while just under the diaphragm on the left was a large abscess cavity located outside the stomach and partially walled off by the liver, containing greenish-yellow pus. A channel could be traced from this abscess to the ileocæcal region with numerous side channels. The abscess was not retroperitoneal.

Eisendrath has reported a case in which, having first simply opened and drained an appendix abscess, he was obliged

a few days later to reopen the abdomen for a recurrence of the symptoms; at the second operation the appendix was removed. In spite of this, sepsis continued, and nearly three weeks later he drained an abscess situated between the spleen, left lobe of the liver, and below the diaphragm. Death followed two weeks later. No autopsy was allowed. Although this abscess undoubtedly originated in the appendix as a primary cause, it is not clear that it may not have come by direct extension from a second intra-abdominal abscess in the left upper quadrant.

Sooner or later, in a large proportion of cases, infection of the pleura in some form is sure to be found. Subphrenic abscesses are more likely to break spontaneously into the pleural cavity or along the pleural adhesions into the lung rather than downward into the abdomen. Metastases in the kidney, brain, lungs, etc., may take place and be important as causes of death (Grüneisen).

In exceptional cases of high appendix abscesses, the infection may creep along the colon to the anterior edge of the liver, whence it spreads to the subphrenic space. Grüneisen reports an autopsy in which a solidly walled canal passed close to and in front of the ascending colon up to the liver. It then extended to the anterior surface of the kidney along its upper end, and to the posterior edge of the liver.

Maydl has observed that extraperitoneal abscesses perforate more freely into the chest cavity than do the intraperitoneal type, but that in the latter exudation into the pleura is more frequent.

Grüneisen recognizes that hepatic abscesses may serve as the origin of subphrenic abscesses.

That infection of the lymphatic channels should take place with great frequency in inflammation of the appendix need cause no surprise, when we consider that that organ and the adjacent walls of the cæcum are peculiarly rich in lymphoid tissue. Clinically, we see, almost universally, some evidence of absorption in the mesenteric lymph-nodes. This is notably evident in children, and it frequently happens that

a bunch or string of tender lymph-nodes is much more in evidence on palpation of the unopened abdomen than the appendix itself, in which, indeed, the gross infective process may have subsided. An analogous condition is seen in the cervical lymph-nodes during and subsequent to microbic invasions of the pharyngeal group of lymphatic organs. It is on a similar basis that we should look for more frequent evidences of lymphatic invasions along the retroperitoneal lumbar chain of lymphatics, presupposing that there is a liberal communication between the lymphatics of the cæco-appendix walls and this lymphatic chain.

Lockwood, in 1900, went so far as to state that this retroperitoneal chain was the main route of the current from the appendix and cæcum; but Poirier and Cunéo scout this idea as "absolutely visionary," maintaining that the normal terminations are the glands of the ileocæcal group, communication taking place to some extent, however, with the neighboring groups directly or indirectly.

Berthelin believes that the lymphatics play only a slight rôle as a means of conduction to the liver, and in support of this calls attention to the absence of connection between the lymphatic system of the cæcum and the liver; he maintains that such an infection can only be through the intermediary of the peritoneal lymphatics, perihepatitis being one of the first manifestations. Jones likewise puts little stress on the infection of the liver through the lymphatics, either intra- or extraperitoneal.

However, lymphatic paths do extend along the retroperitoneal space to the liver, diaphragm, and thoracic regions; and, in addition, there is a communication between the lymphatics of the diaphragm and those of the peritoneum, while, as the well-known experiments of Clarke and others show, direct absorption of infection may take place from the general abdominal cavity into the diaphragmatic lymphatics. If to these paths we add the mechanical portage of pus and its germs from abscesses in the peritoneal cavity pressing directly upon the liver substance, we have still another manner of origin of hepatic abscess secondary to an appendicitis.

Infection does not necessarily produce abscesses at its point of origin here any more than in other lymphatic tracts in the body. The abscess formation may take place at some higher point, like the peritoneal space of the subdiaphragmatic region. Thus a subphrenic abscess starting undoubtedly from the cæcal region may display no trace of abscess in any part of its course (Grüneisen).

Battle and Corner realize that while infection by the lymphatics must be common, considering the septic nature of appendicitis, yet it is often not recognized. They, too, have encountered retroperitoneal abscesses supposed to be of glandular origin, the primary source in the appendix not being recognized.

Fowler, who terms this retroperitoneal infection a "lumbar phlegmon," states that "a history of an attack of appendicitis may be absent, and yet the infection has its origin in the appendix." This is less true now than a few years ago, because surgeons at least are recognizing with greater accuracy the typical symptoms of mild and transient appendicitis that are overlooked or underestimated by the observer of small experience.

Furthermore, in analyzing the earlier reports of cases, one who reads between the lines can hardly fail to recognize mild or subacute appendicitis from the signs that failed of interpretation at the time.

Infection by way of the arteries is one of the manifestations of a general pyæmic process, and it may be dismissed here without further consideration. So, too, with infection from or by the bile passages.

Typhoid ulcerations and tuberculous ulcerations are rarely the source of hepatic infection.

Semmola and Geoffredi state that tuberculous ulcerations are never the cause of suppurative hepatitis because they cause obliteration of the veins, and we can recall no case reported where there was a definite relation established between such an intestinal lesion and an hepatic infection. Cases from puerperal infection are rare, but the possibility must be considered.

One of our cases had tuberculous ulcers of the colon, but it is hardly probable that the severe hepatic infection had its origin from this source. The history of the case is as follows:

T. A. T., male, seventeen years old, was operated on at the City Hospital on July 26, 1901, by Dr. E. H. Nichols. A year before he had had a short attack of probable appendicitis. Four days before operation he had had an attack of severe, sharp, abdominal pain in the right side followed by vomiting, chills, marked tenderness, and severe weakness. At entrance he had jaundiced sclera and some tenderness over the hepatic region, the abdomen being soft except over a local mass in the region of the appendix. Dr. Nichols found a long, distended, congested appendix in an inflammatory mass. This was removed and the wound drained. The following day the temperature remained high, and there was slight delirium with persistent tenderness over the liver. Two days later the wound was dressed and the wicks changed. Four days later the jaundice was fading from the eyes, the wound looked clean with slight discharge, but the boy had had a chill on this day and the day before. Widal negative, leucocytosis of 10,200. Six days after operation he was having mild chills daily, occasional vomiting, continuation of the jaundice, and extension of the liver border two fingers' width below the ribs with moderate tenderness. He was growing weaker, slept much, but held food both by stomach and by rectum well. The wound was in a satisfactory condition. On the following day there were high-pitched râles throughout the right chest, with dulness at the right apex. The pulse had increased to 140; the boy vomited twice and had severe chills. Considerable pus or foul matter escaped this day from the wound. Tube replaced. He improved a little for five days, and then had chills again, with a temperature of 106.5° F., the liver still being enlarged and tender.

August 5, I operated because of jaundice, irregular chills, vomiting, rapid loss of strength, and hepatic tenderness. At no time had there been spasm in the flank. At operation the right lobe of the liver was found enlarged and œdematous posteriorly, but showed no evidences (such as localized swellings) of abscesses in its substance. A director was passed into the liver in various places without reaching pus. Along the spine, a large

fluctuating gland, the size of a hen's egg, could be felt about the level of the lower end of the kidney. Above this were several swollen glands in a chain about half an inch in diameter. The larger gland was opened, a drachm or two of foul pus being evacuated, and packed with iodoform gauze. The wound was partially closed, space being left for the exit of an iodoform gauze wick passed down to the liver punctures, and of a drain from the gland abscess. Exploration of the appendix sinus was negative.

Five days later, when the wound was dressed, there was a slight purulent discharge; the temperature was still quite high, and patient was more drowsy and more septic looking. He had vomited the same night, and the temperature rose to 106° F. and pulse to 144. On the 13th the pulse and temperature were making wide excursions up and down, the patient was growing weaker, the sclera had become more jaundiced, and he was losing ground. Under chloroform, exploration through the sinus showed an area of necrosis of the colon about the size of a five-cent piece that broke on examination. From this area a narrow band of necrosis of the gut extended towards the mesentery as if from a thrombus. Exploration below this area showed almost total subsidence of the gland that had been previously opened, but below it in the iliac fossa were two or three small glands, one of which contained about a half a drachm of pus. Nothing abnormal could be found in the liver or elsewhere in the abdomen. The cavity was drained with iodoform gauze. The patient was in poor condition, but stood the operation fairly well. He steadily failed, however, and died two days later. Urine negative throughout.

Autopsy showed the mesenteric lymph-nodes enlarged from ½ to 2 cubic centimetres in diameter, and grayish pink on section. Behind the cæcum was a large node 3 centimetres in diameter, with a caseous and calcified centre. Another node higher up had a soft, purulent centre. Branches of the superior mesenteric vein from the lower part of the ascending colon contained clots. In the region of the hepatic flexure of the colon was a deep, punched-out ulcer with stitches round about it. Nearer the cæcum was a second deep, punched-out similar ulcer, smaller in diameter. The liver showed numerous small abscesses, 1 to 3 centimetres in diameter. Diagnosis: thrombosis of the superior mesenteric vein and its branches; suppurating pylephlebitis with multiple abscesses of liver. Ulcers of the colon, chronic tuberculosis of the retrocæcal lymph-glands.

(For detailed autopsy report, see *Boston City Hospital Reports*, 1902, page 147.)

Loison (1900) states that the appendix adhering by inflammation to the parietal peritoneum enters into direct relation with the lymphatic vessels that lead to the diaphragm, and says that an abscess may form in the retroperitoneal tissue, producing the type designated as paratyphlitic by Oppolzer and others.

Koerte holds that the appendix may not even become adherent to start the infection, the invasion taking place between the folds of the mesentery. He regards this form of infection as less virulent than that which takes place through the portal tract; this is probably true because the barriers against an overwhelming dose of poison are less evident in the portal circulation than in the lymph channels. Even if the infection has reached the liver by the lymphatics, its spread there will be less active than if brought directly along the portal tract.

Robinson (quoted by Loison) explains some cases of transmission by the passage of pus along the parietocolic sinus which runs from the appendiceal region to the inferior surface of the liver, where it ends in quite a pocket in which pus may collect remote from the rest of the peritoneal cavity. This observation probably explains the findings in the following case of ours, although it is possible that the pus in this pocket may have been secondary to an abscess of the liver that had emptied spontaneously.

C. E. M., male, forty-two years old, was seen May 19, 1904. He had been treated by his physician, since April 23, for typhoid. There was a history of fever, malaise, tenderness in the right iliac region without vomiting. Tenderness over the appendix was definitely marked. The temperature had ranged from 100° to 102° F. and the pulse from 100 to 120, rising steadily. A few days before I saw him there had been chills. There had been slight jaundice at first, not noted in the eyes, but in the skin, with bile in the urine. This had improved. The patient was restless and hiccough had been troublesome. There had been tenderness over the right lobe

of the liver, and slight delirium at times. The patient stated to me that he had been well up to a sudden attack of abdominal pain at the beginning of his illness, although he had been feeling poorly for a week or more before that. Examination showed a very sick, wasted, anæmic patient with a dry, dirty tongue; he was slow mentally but intelligent. He had a poor, thin pulse, rapid, but regular. The abdomen was dry and distended, but without spasm. Deep in the right loin was a tender mass, feeling like an enlarged right lobe of the liver in its lateral half. Under the right costal border there was also tenderness and swelling of the liver. Left lobe palpable. Spleen not enlarged to percussion. There was doubtful increase of tenderness over the appendix. The upper border of the liver was an inch or more above normal. No jaundice. Patient was much worse since his chill two days before my visit, and seemed too sick to warrant interference. A fatal prognosis was given, but, if under feeding and stimulants he showed signs of rallying, operation was advised. In a few days the patient was taking double the amount of nourishment, the pulse had dropped a little, and the temperature had fallen to normal. He was better mentally and there was less abdominal tenderness. Shortly after this he entered the Quincy Hospital, where operation took place two and a half weeks after my first visit. Under ether the abdomen was opened over the right hypochondriac tumor and a foul abscess, involving the under surface of the right lobe and the adjacent portion of the peritoneal pocket, was opened. It was impossible to determine whether the abscess had originated within the liver or had penetrated its lobe secondarily. There was evidence of old trouble around the appendix, but the patient was in too poor condition to justify prolonging the operation, so the abscess was drained, and the patient after a rather stormy course for a few days steadily and slowly recovered. Appendectomy was reserved for a later operation.

Nash, in a child of fifteen, found pus in a cavity between the colon and the layers of the mesentery which was adherent to the under surface of the liver. On separation of the adhesions the liver was found rough and broken down. There were also broken-down retroperitoneal lymph-nodes. Here there was not only an invasion of the lymph channels, but the

liver was invaded by direct implantation of an abscess pushing itself along the cellular tissue. This same condition has been seen in one or more of our cases, and Cantlie has reported a similar case.

Abbadie recognizes infection by the lymphatics, but considers it exceptional, the main origin being through portal invasion.

Infections are not necessarily limited to the liver, as we may find at the same time abscesses of the pancreas, spleen, pleural cavity, lungs, etc.

Cantlie, in an autopsy on a case of hepatic abscess, found that the pus had burrowed up between the diaphragm and liver from a large perityphilitic abscess, the abscess in the liver coming this way and not evidently by way of the portals.

Perihepatic abscesses, secondary to empyema, may be found, and it is possible that an empyema starting from a pneumonia which exhibited the peculiar abdominal signs so deceptive in its earlier stages might easily cause hesitation in locating the true origin. Such abscesses are less likely to contain foul pus, and, indeed, in a case reported by Beule the pus was sterile.

It would be interesting to differentiate the lymphatic-hepatic cases originating in appendices intra-abdominal in position from those where the appendix, as a result of some developmental process, is partly or entirely extra-abdominal. In some cases this is impossible, because, either as a result of previous attacks or because of extensive destruction in the present attack, all anatomical landmarks are obliterated, and an organ originally freely movable within the general cavity may have become firmly ensconced behind the cæcum with a new peritoneal covering.

An appendix adherent to the peritoneum over the iliacus may perforate on its under side and directly infect the retro-peritoneal space without involving the peritoneum (Hawkins). Such cases may extend downward instead of upward and be opened in the groin, thigh, or even in the opposite groin. Gallant has reported three such cases where the infection was found in the pelvis behind the peritoneum.

Koerte, in the *Berliner klinische Wochenschrift* for 1892, has reported a case of a man, twenty-nine years old, in whom, after an attack of appendicitis, he had resected the tenth rib in the postaxillary line, opening a foul abscess cavity in the liver. At autopsy an abscess of the liver and subphrenic space was found, and a perforating appendix with abscess. Behind the colon a passage, containing pus, led upward to the round edge of the liver, whence a tract extended outward to an abscess between the spine and right pleural cavity. Such cases, starting in all probability behind the cæcum, are reported by Brewer and many others. We are inclined to believe that the appendices that originally are extra-abdominal, and without any peritoneal covering, are presumably less able to direct the lymph currents within the normal channels, and so give rise to the most fulminating types of lymphatic poisoning. In this connection the following case illustrates how unrelenting such an infection may be from the outset.

M. McC., female, aged twenty-five years, was seen March 12, 1899, with Dr. Washburn. She had been ailing for a year, and was supposed to have some ovarian trouble. Four years ago there had been some form of obstipation, from which she recovered in two days. Three days before I saw her she had had sharp pain in the lower right abdomen, nausea, and chills. The day before my visit she was comfortable, but the temperature was 103° to 104° F., and the pulse 120. She looked ill and had general abdominal tenderness with slight spasm. In the right side over the appendix there was acute local tenderness. A diagnosis of acute appendicitis was made and operation was done at once. On opening into the subperitoneal fat, pus escaped from towards the pelvis, but on opening into the peritoneum, only one coil of small intestines was found lightly adherent with lymph. Opposite the abscess in the cellular tissue the peritoneum was opaque and injected; otherwise, there was no evidence of trouble. A further exploration of the retroperitoneal space showed a cloudy, œdematous infiltration extending towards the kidney, and, on peeling back the peritoneum towards the median line, search for the appendix was made in vain. There was considerable thick, inflammatory deposit on the iliacus with a slightly honeycombed appearance, from which thin pus escaped. The patient stood the

operation fairly well, but the pulse was 140 to 160 throughout, though of good volume. The following day she was not so well. The wicks in the retroperitoneal space were dry, without evidence of serum or pus, and the peritoneal flap looked gangrenous. Two days later the patient died. Autopsy by Dr. R. M. Pearce seven hours postmortem.

"Abdominal cavity. Intestines are markedly distended with gas and bathed in a thin yellowish purulent fluid. Where in contact the coils are united by yellowish white fibrinous exudate. In the pelvis there is considerable free purulent fluid. Blood-vessels of intestine are much injected. The surface of the liver and spleen is covered with fibrinous exudate. The cæcum with the appendix lies completely behind the peritoneum. The appendix is bound down to the cæcum by easily broken adhesions. Its distal end is collapsed. At about its middle is a constriction, between which point and the cæcum the appendix is distended and injected. On opening up the appendix thin pus is found throughout its lumen, but in greater amount in the proximal half. The mucous membrane of this portion is also very much injected, but there is no ulceration, no foreign body. In the loose areolar tissue lying behind the peritoneum in this region a thin layer of purulent fluid can be seen extending up as high as the middle of the right kidney.

"Anatomical Diagnosis. Acute appendicitis, acute general purulent peritonitis, acute splenic tumor, retroperitoneal lymphangeitis, peritoneal exudate.

"Smears show pus-cells, fibrin, bacilli, and short chains of flattened diplococci (evidently streptococci).

"Cultures show colon bacillus and streptococcus, the latter abundant."

Portal Infection.—The majority of abscesses of the liver are reported in connection with dysenteries of one sort or another, mainly tropical. A study of these throws light on the abscesses that come from appendicitis so far as method of origin, location, etc., are concerned, but when it comes to treatment, the story is far different, mainly because of the extreme difference in the degree of infection of the two types, and also because of the proclivity of abscesses originating in perityphilitis to assume the diffuse miliary type.

Some of the earlier abscesses which were described as pyæmic can be explained as typical portal infections, so far as the clinical history and the post-mortem findings show. (Cases of Ashley, 1879, and others.)

In earlier reports we find abscesses of the liver ascribed to a dysentery where incomplete autopsies throw no light on the true origin, but where a careful study of the clinical history points to an overlooked appendicitis. (Cases of Balfour and others.)

The mode of infection and its pathology are so well known that it need not be taken up here at all. It is the most frequent source of typical intrahepatic abscesses. As some of our cases show, it is not uncommonly associated with a recognizable degree of lymphangeitis, though the latter proves not to be the source of the abscesses in the liver. Whether this association indicates a special virulence of the infecting agents or a lessened resistance to the invasion both on the part of the veins and of the lymphatics, cannot be told from the few data at hand. The association is not referred to by writers in general, but our clinical experience would incline us to believe that it is more than a chance one. To illustrate this, one of our cases may be reported here.

H. C. B., male, aged thirty-five years, had had several attacks of severe abdominal pain and vomiting in the past six or seven years. Each time he had been a little yellow, but without chills, and the attacks lasted only a few days. Three days before entrance to the hospital on April 25, 1901, he had a sudden severe attack of appendicitis followed by slight jaundice and a leucocytosis of 13,000. He was treated in the medical wards for a month, during which time he had occasional chills with high temperature, epigastric pain, progressive emaciation, variable jaundice, and leucocytosis increasing steadily up to 43,000 at the time when I saw him on May 27.

Examination showed a much emaciated, jaundiced, septic-looking man, with an enlarged liver, especially marked on the left, and with doubtful tenderness over the appendix. Under ether the abdomen was opened in the median line above the umbilicus.

One small pinhead abscess was found on the anterior surface of the right lobe. The left lobe was uniformly enlarged, but on the under surface there was a deep, slightly indurated swelling. This was opened, and a cavity containing pus was found. Careful examination of the right lobe failed to show any nodules suggesting abscess, and exploration failed to show pus. The gall-bladder and neighboring region were normal. The appendix, subacutely inflamed, was removed through a small opening. The patient was in poor condition before operation, but on the following day the temperature had fallen to normal, and the pulse had fallen to 120. There was considerable discharge from the liver. Three days later the temperature remained down, but the pulse was rapid and weak, and he looked badly. Two days after this the patient, in straining, broke open the appendix wound, and had a prolapse of intestines which, when discovered, were dark and strangulated. The intestines were replaced and the wound packed, but the patient gradually failed and died.

Autopsy showed between the spleen, stomach, left side of diaphragm, the liver, and posterior wall of the peritoneal cavity, an abscess containing offensive, yellowish, semifluid material. All the mesenteric lymph-nodes were somewhat enlarged. One node was softened, and contiguous to it was a canal, that is, a mesenteric vein, with roughened yellowish wall admitting the little finger and communicating directly with the portal vein. On section through the left lobe the portal veins were dilated and contained pus. In the right lobe, particularly towards the superior surface and the right, were numerous small abscesses arranged in clusters, 3 to 5 centimetres in diameter. Smears from the portal veins and subphrenic abscess showed streptococci.

Diagnosis: left subphrenic abscess, mesenteric and portal pyophlebitis, acute general peritonitis, multiple abscess of the liver. The case also illustrates the additional infections by direct extension to the subphrenic region.

(For a full report of the autopsy, see *Boston City Hospital Reports*, 1902, pages 146–184.)

"That infection from a thrombophlebitis is not more common is surprising when we consider the free circulation that exists between the mesenteric and portal vessels. But as

a matter of fact, it is only an occasional complication." (Fowler.) I would venture to suggest that the complication is more common than statistics, especially postmortem, indicate, because I believe that mild infections do take place from which the patient recovers spontaneously. But more of this later on.

Infection in the left lobe as well as the right may take place through the portal channel, but there is almost always a more pronounced infection in the right lobe owing to the anatomical relations of the portal branches. Yet Jackson in an autopsy of a case found the left lobe more extensively riddled with abscesses than the right, showing that the process was either older or more rapid in the left side. This was one of the earlier cases that I saw with Dr. Jackson, and has been reported in full by him in the *St. Paul Medical Journal* for 1899.

Very suggestive in this respect is a case that I saw with Dr. V. Y. Bowditch, and, though we have no post-mortem findings, the clinical signs pointed to a left lobe enormously enlarged as compared with the right. The case is as follows:

M. McA., female, aged twenty-seven years. Five or six weeks before I saw her there was a very definite history of an attack of mild appendicitis followed in about a week by symptoms severe enough to require her to go to bed. Soon she had irregular chills, which had continued more or less ever since. No jaundice was noticed until within the last ten days, when there had been a slight tinge of yellow. Recently she had had severe chills daily, sometimes lasting for an hour. The temperature had been irregular, but it was taken at irregular intervals. Her physician, supposing it to be a case of tuberculosis, referred her to Dr. Bowditch, who in turn diagnosticated it as portal pylephlebitis. In her attack six weeks before I saw her, she gave a history of tenderness in the right iliac region, and an area of exquisite tenderness in the right loin. The urine was negative. She had recently been seen by another consultant, who made a diagnosis of general tuberculosis. At my visit I found a tender, swollen left lobe of the liver extending down to the

level of the umbilicus in the flank and sloping upward across the median line to about the eighth or ninth cartilage on the right. The right lobe was swollen, but much less so than the left, the lower border coming down only about an inch below the ribs. Both lobes could be felt posteriorly in the flanks. There was slight distention and general tenderness on deep palpation over the entire abdomen. I could detect no jaundice. There was slight œdema of the abdomen over the loins. Leucocytosis, 10,000.

I again saw her four days later. The temperature had continued at about 102° to 103° F. The pulse was steadily rising to 120. She was delirious and had had a chill every day, vomiting more or less. The left lobe was of the same size as before, but on the left border it seemed a little more superficial, with a definite area of tenderness. There was distinct parietal œdema by this time. Right lobe same as before.

In a small area low down in the anterior axillary line over the upper surface of the left lobe there was a friction rub. She had had two serious attacks of collapse.

The case was transferred to my care for operation if thought best, but the patient was in so desperate a condition that I advised against it unless there was evidence of some gain under stimulation. Two days later, although stimulation and rectal feeding had been carried on, the patient was definitely worse. She was delirious most of the time, with beginning œdema of the lower extremities, and was too ill, in my judgment, to warrant interference. She rapidly lost ground and died a few days later.

No autopsy was obtained.

One of our earlier cases, a boy of eleven, at operation, exhibited a left lobe much swollen and pushing the right lobe far to the right and backward, so that the abscess in the former lay under the right rectus. An abscess in the right lobe was also opened opposite the tip of the twelfth rib. In this case the epigastric tumor before operation was naturally supposed to belong to the right lobe.

Another of our cases showed a predominance of abscesses in the left lobe, and is worth detailing on that account as well as on others.

W. C., male, thirty-six years old. Operated upon April 5, 1903. There had been a history of preceding attacks of appendicitis, and an attack just before his entrance to the medical wards two weeks before I saw him. At one time there was slight jaundice. He had an epigastric tumor, which, being aspirated by the visiting physician through the abdominal wall, gave exit to pus. When transferred to the surgical wards he was delirious and septic, with a fat, distended abdomen. This was opened in the epigastrium and free pus was found in the neighboring abdominal cavity, with a large group of confluent abscesses ready to break in the right hepatic lobe. The mass was broken up and found to extend directly through the organ to the under surface. The abscess cavity was drained with gauze.

A second incision was made over the appendix and an abscess opened up there. The cæcum, gangrenous and accidentally opened, was brought up and sutured to the surface. The patient was in bad condition and died within forty-eight hours. A partial autopsy showed three groups of abscesses, that which had been opened being in the right portion of the left lobe instead of in the right lobe as was supposed at the time of operation. Another group lay at the dome of the left lobe, and a third group in the left edge of the left lobe.

These abscesses were undoubtedly portal in origin, there being no evidence that they were direct infections from a left-sided peritonitis. Aspiration had resulted in soiling the cavity with the contents of the abscess, but that had happened only two days before operation.

Time of Formation of Pus.—There must be a considerable variation depending on the individual, the type and amount of infection, etc., in the time required for the formation of pus in appreciable quantities. The clinical data on this point are very vague, but apparently there may be a wide variation in certain instances. One of our cases is of interest in this regard.

C. D., male, aged thirty-five years, entered the hospital August 11, 1896. Five months previously he had had an attack of appendicitis with tenderness and vomiting, followed by a second attack six weeks later, more severe in character. The

day before entrance an attack came on with pain over the appendix, vomiting, malaise. As he continued to grow worse operation was done at once. I found acute localized appendicitis. The appendix was removed and the cavity was drained. On August 30 there was a healthy sinus about an inch deep. Then the temperature, which had been normal, began to rise. Soon he had more or less vomiting, and a chill.

September 13, the pain over the liver had increased, and over the right lower chest there was a friction rub. Under ether the abdomen was opened and the liver explored for pus in vain. No improvement followed, and the wound of this operation was healing kindly when, seven days later, on September 20, it burst apart and much foul pus mixed with bile escaped. On the following day the patient had a chill and was much worse. The upper wound was draining and its cavity was washed out. He then improved; the chills ceased together with the vomiting, and there was free discharge of bile and pus from the sinus. On October 4, the patient had lost ground again with several chills and profuse discharge of bile-stained pus from the operating wound. The cough which he had had for some weeks continued and vomiting again began.

October 12, there was much foul discharge from the operating wound and a profuse foul expectoration with occasional chills and vomiting. He took plenty of food and stimulants, however. The expectoration and the discharge from the wound continued up to about November 8, when the temperature fell to normal, the cough ceased, and the patient steadily improved, being discharged December 7, looking and feeling well. When seen several years later he was well and strong.

This case illustrates the lateness at which hepatic infection may follow the original appendicitis, and at a time when presumably all reasons for apprehending a mesenteric phlebitis are passed. As an example of the spontaneous cure by evacuation through the lungs it is also interesting, and it is a question whether recovery might not have followed without the anterior drainage of the liver.

A case of pneumonic infection of the liver illustrates the enormous rapidity with which a general enlargement may take place.

E. H., male, aged twenty-three years, was transferred from the medical wards of the Carney Hospital where he had had the crisis in an attack of pneumonia two or three days before. This was followed at once by return of high temperature and high pulse, the latter increasing in the last day. He was delirious with jactitation. The liver had increased rapidly in size within the last twenty-four hours, the lower border reaching to the umbilicus.

There was an indefinite history of previous appendicitis. A diagnosis of liver abscess was made.

Operation under primary ether. The abdomen was opened through the right rectus, and the liver was found much enlarged, dry, hard, and smooth, but without mottling. Abdomen elsewhere negative. Most of the enlargement of the liver was in the right lobe. It was explored in various directions with a director, but only once did anything escape looking like granulation tissue. The wound was closed, allowing for an iodoform gauze wick to the upper surface of the liver. Patient died within twenty-four hours.

McClelland has reported an interesting autopsy in this regard. A rapid enlargement of the liver took place after an appendix abscess, caused by a pin, the liver extending down to the umbilicus. There was no jaundice, the patient being typhoidal for a week, when he died. In the right lobe were one large and numerous small abscesses. The left lobe was enlarged but free from abscesses. It is unfortunate that the clinical signs of swelling of the left lobe were not noted. It is probable that its enlargement started some time after enlargement of the right lobe was first noticed.

In Thompson's article on " Pylephlebitis," in *Boston City Hospital Reports,* 1902, one of the autopsies showed " no abscess in the liver, though the branches of the portal vein in the liver substance were filled with pus, and the increased connective tissue in the liver seemed to show the process to be of some duration."

Sheen in 1896 reported an interesting case bearing on this subject.

A woman of twenty-seven years had an appendiceal abscess opened, the appendix not being found. No improvement ensued, but delirium,

jaundice, and chills came on, and a month later a large mottled liver was explored with negative results. The jaundice then faded, but an abscess in the neck required operation. Three and a half months after the first operation, during a slow convalescence, swelling appeared in the right lumbar region. This was opened between the ninth and tenth ribs and foul pus evacuated. Recovery followed. The history certainly suggests a typical portal infection, and in the light of the slow progress in some of our cases it is not at all impossible that an area of infection limited in extent had lasted for that long period.

Interval between the Attack of Appendicitis and the Manifestation of the Hepatic Abscess.—This varies within very wide bounds. It apparently may take place almost directly with the onset of infection in the walls of the appendix, or it may be delayed for weeks or months. Moreover, the appendiceal evidences may have subsided to such an extent that it is easily overlooked as even a possible cause. There are numerous illustrations of this in literature.

Lelong reported a case in 1891 which, judging by his account of the symptoms, had had definite attacks of appendicitis some time before entrance to the hospital, with chills, jaundice, etc. A month later autopsy showed a subsiding appendicitis with only a little pus in its lumen, and abscesses in both hepatic lobes. This picture can easily be carried a little farther, and one can imagine an appendix at autopsy showing nothing beyond a slight thickening of its coats or a few punctate hæmorrhages coincident with a liver riddled with foul pus. In such a case it would not be easy to convince the pathologist that the *fons et origo* lay in the innocent looking appendix; but the clinician who can seek back and elucidate the undiagnosed attack of appendiceal infection that was present a few weeks earlier will be inclined to ascribe the hepatic lesions to this rather than to some less apparent cause.

Grüneisen found that five days was the shortest interval between the beginning of the disease and its manifestation in the subphrenic space. In most of the cases the interval was about two and a half weeks. It is easier to imagine a much more rapid transportation of infection by the portal channels than by the lymphatics, and I am inclined to believe that such

is the case. If so, it would necessarily limit Gerster's suggestion of eliminating the nidus of infection in the mesenteriolum at the time of removal of the appendix.

That spontaneous healing is not impossible nor even infrequent, in cases of mild infection, I think is shown by the recovery at times of patients who show the typical signs and symptoms of hepatic abscesses in the course of an appendicitis. There is, of course, neither operative nor post-mortem proof of this observation, but the clinical evidences are very convincing.

The experiments of Lemaire showing that the liver offers to the colon bacilli protection against a general infection up to a certain extent would help to bear this out. He shows that the work is done mainly by the endothelial cells of the hepatic capillaries, purification of the infection, if not too virulent, taking place within a few hours. That such a purification may come about in portal invasions seems not impossible.

Legg in 1875 exhibited a case of infection where there seemed evidence of healing in some of the hepatic abscesses. In this instance there had been an appendicitis caused by a pin, followed by a general peritonitis.

Reichardt in 1903 stated that abscesses may occasionally heal by encapsulation, and Tillmanns speaks of the cicatrices that occur from the resolution of small abscesses.

In this regard we must consider a curious case reported by Treves, in 1894, of a young girl of fifteen who had had several attacks of appendicitis. About a week after the attack in which he saw her, she had rigors which occurred irregularly for a week. She steadily lost ground, became emaciated, typhoidal, and delirious, but was not jaundiced. A month after the beginning of the attack Treves operated, and found a normal looking appendix without peritonitis. The liver, however, was evenly enlarged, soft, and the surface was covered with minute yellow specks. There was neither ascites nor adhesions. The liver was not explored, but the abdomen was closed and recovery followed from that date. He could give no explanation for the result, unless it was because of some change in circulation following operation. The evidence, of course, is not convincing that it was a simple case of infection, although the history and appearance of the liver are very suggestive.

We have seen a similar result follow exploration in a case with chills, delirium, jaundice, and enlarged, tender liver that

before operation was supposed to be an acute portal infection, but at operation was diagnosticated as an acute hypertrophic cirrhosis. Our case was treated for alcoholic cirrhosis (atrophic) a year or so later, but in Treves's case there seems no reason to suspect alcohol as the origin.

The following case reported by Bryant with autopsy is of interest in this regard. Male, eighteen, admitted with sinuses in the left groin which had persisted for three months. During this time he had had several attacks of jaundice. At entrance, foul, green pus came from the sinuses. A month later an abscess above the iliac crest on the left was opened and a large quantity of pus evacuated. Four months later there was swelling in the right groin, which was opened. A month later an abscess was opened on the left below the ribs, from which fæcal matter escaped. Death six months after entrance. Autopsy showed an abscess of the appendix as the origin. The liver showed scars of old abscesses. One abscess was in a caseous state. There was some pus in the portal canals. The portal vein was completely blocked by a soft clot.

The medicolegal bearing of these cases may be of interest at times, and a case reported by Koch bears on this point.

A man of forty-eight years was injured in his appendix region in April, being in bed several weeks, but recovered and was able to be around until the following September, when he had an acute attack of appendicitis, which was not operated upon. Three weeks from this onset he had an enlarged liver, was of a pale yellowish color without icterus, and a week later was operated upon. He died three days afterwards, autopsy showing a gangrenous appendix with abscess, and abscesses of the liver.

Stewart in 1901 also reported a case with symptoms of appendicitis following a blow in the right iliac region. Five days later an abscess was opened, and a week later a second abscess in the left side of the abdomen was evacuated. The following day the patient had chills with other signs of sepsis, and in the course of a few days he coughed up foul pus containing colon bacilli. The left pleural cavity was then drained and recovery followed. In this case the infection probably did not take place through the portal route, but either by direct invasion of an abscess in the upper left abdomen or by the left retroperitoneal lymphatics. Its medicolegal bearing, however, is of interest.

The age at which these infections take place is limited mostly to young adults. According to statistics of Musser and others, children below fifteen are quite exempt from portal infections. We have had one case in a boy of eleven reported elsewhere.

Subphrenic abscesses are rare in children from any cause, and from appendicitis they are very rare. Of 169 cases collected by Maydl from all causes, only ten were in children below fifteen years of age. Of these ten only one was primarily infected from the appendix. Jopson has added twelve cases, and of these six were due to appendicitis. Why this rarity should exist it is hard to say; but from the much greater proportion in Jopson's recent collection, it is possible that investigation of the appendix at autopsy and operation has of late been more searching. We have seen two children under fifteen with lymphangeitis, and there seems to be no valid reason why the process should not invade the subphrenic space as well.

S. J., female, aged eleven years, operated upon by Dr. Lund for acute appendicitis on July 24, 1900, five days after onset of the attack. Improvement followed, except that the temperature and pulse persisted above normal, with spasm and tenderness in right lumbar region. On August 13, under ether, I operated, exploring the abdominal sinus and the rectum, but failed to find any well defined area of induration. A short incision in the right loin exposed the kidney, and on pushing anteriorly a double chain of enlarged lymphatic glands was found. At one place granulation tissue surrounded two of the glands, but without evidence of an abscess. The wound was packed with iodoform gauze. Practically, no pus drained from the posterior sinus, but the patient slowly improved and was discharged relieved. It is doubtful if the posterior drainage influenced the progress of the trouble, although the symptoms and the examination at operation demonstrated a moderate degree of lymphangeitis. I have seen similar cases quiet down under hot poultices.

B. C., female, aged fourteen years, was seen November 28, 1897, with Dr. Dorman, and operation performed for acute appendicitis with a large foul abscess extending into the pelvis. The right tube, swollen and inflamed, was removed, together with the gangrenous appendix. Recovery was complete. On May 31, 1899, eighteen months later, I saw the patient again. Since operation she had been well, attending school and riding a bicycle. A few days before I saw her she began to have pain in the appendix region, with elevation of pulse and temperature, but no

chills. Some fulness and tenderness with spasm were found in the region of the appendix. The tenderness appeared to be along the outer edge of the iliacus, not extending towards the kidney. Slight spasm of the abdomen. The scar was solid. Three days later, as the pulse and temperature did not subside, I operated, making a short incision alongside the scar to explore the peritoneal cavity, but no evidence of peritonitis was found. The psoas and iliacus were swollen in the line of the sulcus. The wound was then closed, and an extraperitoneal dissection carried on through a second incision until a small abscess cavity was found containing foul, stinking pus, and a concretion of the size of a pea at the iliopsoas junction. This cavity was curetted out and drained and recovery promptly followed.

The pleurisies secondary to typhlitis are fascinating as studies, but they represent only a more advanced step in the class of cases that we are considering, and therefore I shall allude to them only briefly in order to round out the clinical picture.

Lepeyre (quoted by Abbadie) divides them into two classes: (*a*) those pyohemic in origin, in which case they may be on one side or the other, and (*b*) those caused by direct propagation; here they are always on the right side, the left-sided types being due to infarcts. The infection is also carried directly, that is, mechanically or by the lymph channels, along the parietocolic sinus, starting from a retrocolic abscess at any distance from the appendix. From this focus there is uninterrupted continuation of the lesion up to the diaphragm. The parietal lymphatics only play an accessory rôle.

Diagnosis.—A diagnosis of either the lymphangeitis or the pylephlebitis that is secondary to appendicitis is at times impossible. In typical cases it ought not to be difficult. Fortunately, both conditions are comparatively rare, hepatic abscess being estimated as present in from 5 to 10 per cent. of all cases of appendicitis. At present there seems no way of estimating the frequency of retroperitoneal lymphangeitis. The grave types are probably less frequent than the portal invasions.

In relating the various diseases with which these appendi-

ceal infections have been confounded, one is surprised at the apparent effort made at times to escape the obvious source of infection. It has been variously mistaken for pyæmia, septicæmia, typhoid, malaria, spinal caries, rupture of a reduced hernia, general miliary tuberculosis, etc. It need not be inferred that the diagnosis is always plain, because the individual types unfortunately vary within wide limits, and all of these diseases may be mimicked to a greater or less extent; but when a careful history can be obtained and when we realize the great frequency of appendicitis, we ought to consider at least the probability in cases exhibiting sepsis, jaundice, hepatic tenderness, with surgical spasm over the appendix region. Typhoid is quite commonly the diagnosis made, but the marked difference in pulse-rate from the very outset and the lack of Widal reaction should be of assistance. So with malaria,—the blood examination, the irregularity of the chills, the disproportion in the size of the liver and spleen, and the definite hepatic pain and tenderness should prevent mistake in most cases. One of our cases was confusing because of the presence of plasmodia. The history is as follows:

L. P., male, aged nineteen years, had been in the medical wards for about ten days with chills, and a leucocytosis increasing from 13,000 to 40,000. Plasmodia were found, but they disappeared under quinine without affecting the chills. There was marked loss of strength with tenderness over the liver, which had increased downward in size. Eight days before entrance he had had an attack of probable appendicitis, with a history of a similar lighter attack the year preceding. There was slight jaundice, enlarged spleen, and fulness and tenderness in the right hypochondrium. Slight tenderness over the appendix, which apparently was palpable.

Operation: incision through upper abdomen on the right side. The right hepatic lobe was much enlarged, the left lobe was apparently normal. The posterior and under portion of the right lobe was slightly mottled, indurated, and irregularly nodular. It was opened freely on the under surface and a large area of porky, trabecular tissue without pus was broken up with the finger.

From in front another opening was made into similar tissue, and the liver was freely broken up with the finger. Bleeding, which was free at first, was easily controlled by packing. The appendix was found, through a second incision, lying in a small abscess full of stinking pus. This was drained. The patient was in a bad condition and required stimulation. The hepatic wound was packed with gauze.

Two days later the patient was much better, with a pulse of 90. The discharge was not yet bile-stained. Three days after operation the pulse suddenly jumped from 90 to 140, the respiration became much more rapid, and he died four days after operation. The dressing done on the third day was stained with bile, but not with pus.

Another case presented meningeal symptoms that were very confusing at the time of examination, although a diagnosis of lymphatic infection was made. The history is as follows:

A. F., female, twenty-five years old. In July, 1903, the patient had had an operation for lacerated cervix; the operation was followed by acute vomiting for ten days. After her return home she was well for two weeks. The present attack began six weeks before I saw her in October, with abdominal pain and tenderness which lasted for three days. Then followed vomiting and diarrhœa, dysenteric in character. Abdominal tenderness persisted throughout the attack. Chills preceded the vomiting. No jaundice was noted. After vomiting two weeks she became very tender in the right hypochondrium, lost about thirty pounds, and recently, following severe headaches, she had become blind. At the beginning of the present attack the temperature and pulse were high for a week or ten days. It then fell to normal, and no record was kept by the attending physician until Dr. O'Keefe, with whom I saw the patient, took charge of her a few days before my visit; he found a temperature of 102° F. and a pulse of 120. At my visit I found the patient apparently blind, with dilated pupils and nystagmus. No paralyses, anæsthesia, nor change in the reflexes were found. She was emaciated and sick looking, with a moderately distended abdomen, visible coils, general abdominal tenderness, more marked over the appendix

region, while in the right loin there was spasm. The liver was not enlarged to percussion. Heart and lungs negative. The pulse was thin and rapid. Diagnosis: appendicitis with lymphangeitis and abscess of the brain. She was transferred to the City Hospital that same evening, but was too ill to warrant operation, and died within twenty-four hours. Autopsy showed an appendix sloughed off from its base, gangrene of the cæcum contiguous to the appendix, and a foul retroperitoneal lymphangeitis. The brain was normal, and nothing was found to account for the blindness. Following is the detailed report of the autopsy.

Peritoneal cavity. The serosa is smooth, gray, and glistening. Transverse colon has a V-shaped fold extending nearly to the symphysis pubis; mesenteric lymph-nodes not notable. On lifting the cæcum, the appendix is found to be obliterated. At its site is a small hole into the intestines. About this the cæcum is somewhat reddened and covered with patches of yellowish fibre. Just above the cæcum, behind the right kidney in the retroperitoneum, is an abscess cavity 8 centimetres long and 3 centimetres wide filled with dirty, yellowish gray fluid. The cavity is ragged and shreds of fibrin adhere to its edges. In the liver no portal infection was found. Anatomical diagnosis: obliteration of appendix with adjacent abscess cavity. Early aspiration pneumonia, slight chronic colitis, fatty change of kidneys, fatty infiltration of liver, pyoureter, œdema of brain substance.

It does not seem possible that a retroperitoneal phlegmon could be mistaken for a renal sarcoma, yet the following case illustrates this most typically!

D. B., male, Italian, thirty-six years old. At Thanksgiving, before his entrance to the City Hospital, he was operated on by a local surgeon at a hospital in a neighboring city, a short right lumbar and a long anterior incision parallel to the costal arch being made. Both wounds were closed at once, without relief to his symptoms. It was supposed at the time that the tumor encountered was malignant. On careful questioning, a history of probable attacks of appendicitis, coming on both before and after this operation, was obtained. Examination showed fever, 16,000 leucocytes, definite appendiceal tenderness, no lumbar spasm, a general septic appearance, and a large retroperitoneal tumor extending

from the kidney nearly to the brim of the pelvis, tender on pressure. After several days' rest the general and appendiceal tenderness subsided somewhat.

At operation, January 16, the abdomen was opened alongside the rectus. No peritonitis was found. Behind the peritoneum was a hard, dense growth pushing forward, so that its surface lay quite close to the anterior wall. The lower edge just above the pelvic brim stopped abruptly. On following down the cæcum, the appendix was found coiled and buried posteriorly in old and recent adhesions, inflamed, and closely fixed to the cæcum by adhesions, but not, apparently, because of its being retroperitoneal. This was excised and the stump inverted. On exploring upward on the outer and posterior wall of the cæcum, the finger burrowed through a mass of granulation tissue into a definite abscess cavity containing an ounce or more of thick pus lying in the midst of a thick dense wall of inflammatory tissue. The kidney could not be definitely located, but there was no evidence that it was involved. The cavity was curetted out and drained with iodoform gauze. Later he was again explored in the back by Dr. Lund, and a small supernumerary kidney was removed on the supposition that it was a gland. The diagnosis of retroperitoneal lymphangeitis was confirmed. Four months later a letter from the patient informed me that he was almost as well as ever.

In jaundice due to catarrh or stone the pulse is markedly slow. Later, of course, infection may take place along the ducts or the capsule of Glisson, and we may then find secondary abscesses with typical rapid pulse, etc., but the preceding history is a long one, often with colics, etc.

From pneumonias or empyemas, especially if ushered in with abdominal spasm, the distinction must be difficult and, at times, impossible. When the appendix infection is manifested only by subphrenic phlegmons or abscesses, an accurate differential diagnosis may be most difficult. The X-ray, the fleeting and non-characteristic abdominal spasm, the predominance of pulmonary signs, and the sputum will aid in diagnosis.

Retroperitoneal lymphangeitis may be confused with a form of perinephritis that is found in children, of which W. R. Townsend has recently reported several examples. This form

of infection apparently comes on the left as well as on the right side, and its origin is not definitely known. Trauma may produce it, and it may prove fatal in cases where there is subparietal injury of the kidney itself. In his cases there seemed to be no reason for suspecting infection from the appendix, though he mentions it as a possible source. The following case of mine may fall in this class; but when we consider that the appendix infection was a possible cause, it seems better to adhere to that as the origin until a better one for this lesion in general is elucidated.

J. S. C., male, ten years old, was operated upon in 1898 for acute appendicitis one week after the onset. The abscess cavity was found full of gas and foul pus, and the remains of a gangrenous appendix were removed. A pocket was also found extending up the loin towards the kidney and down into the pelvis. The patient made a satisfactory and rapid recovery.

Fourteen months later I was again called to see the patient. He had been perfectly well ever since operation until four days before my visit, when, after playing ball, he became ill and had abdominal colic. He had a high temperature and pulse, was septic, somewhat stupid, and occasionally vomited. Examination showed marked tenderness in the right flank, no spasm of the abdomen anteriorly, but a mass in the retroperitoneal space near the kidney. Operation was advised, but refused. The boy was ill for a very long time, having several relapses similar to the attack in which I saw him, but he eventually recovered under medical treatment. In all probability some form of infection in the retroperitoneal space lay dormant from the time of the original attack of appendicitis only to be aroused later by some minor injury.

Among other sources of infection of the liver the rectum is well recognized; so, too, are ulcers in the stomach and duodenum. In the latter instance it might be difficult or impossible to distinguish at times between a direct extension from a duodenal perforation and an appendix abscess situated high in the abdomen, or between a gastric perforation and a distant abscess in the peritoneal cavity secondary to an associated appendicitis.

Infection from abscesses and gangrene of the lungs, purulent bronchitis, endocarditis, etc., where the arteries are the pathways of infection, may also be found. In cases of an open foramen ovale, infection may pass directly from the venæ cavæ to the liver, and, according to Lassen, may pass directly through the lungs, only to be stopped at the liver.

Weber has shown that between the pulmonary arteries and veins there are connecting branches whose lumen is greater than that of the capillaries; these, too, may afford a pathway for infection.

Among remote sources of liver abscess may be mentioned infections in the upper and lower extremities, osteomyelitis, septic renal tumor, broken-down inguinal lymph-nodes, etc.

All these sources must be considered in dealing with supposed infections from appendicitis, because the elimination of the origin is as important as the recognition of the process going on in the liver or retroperitoneal tissues.

The outlook in both the hepatic and lymphatic infections under consideration is serious, especially in the cases where the infection has invaded the liver by way of the portal channels. The phlegmons, especially those in the lumbar region, may be classed with similar phlegmons elsewhere. A certain proportion will serve as the starting-point for a fatal overwhelming septic intoxication, but the majority, if recognized and freely drained, will recover. Grüneisen states that, when the process has advanced to the subphrenic space, the mortality is about 50 per cent.; however, about half of the fatal cases die within the first few days following operation because the disease is not recognized early enough, and septic absorption has progressed too far to be relieved by local drainage. Even with a temporary recovery, later interference may be necessary for secondary empyemas, etc. Those who practise the early and radical removal of the appendix claim that their experience in these lymphatic infections is thereby limited, and this is most probably true. Nevertheless, it must be admitted that often the early phenomena of appendicitis are so mild or indefinite that there is no urgent indication for radical

operation. In this early period lymphatic invasion may already have started. Furthermore, at times, removal of the appendix even within the first thirty-six hours will not retard the development of a lymphatic infection, and, as some of our cases show, there may be a latent septic deposit incident to an earlier attack of appendicitis, needing only the additional impetus of a fresh irritation to produce a serious condition of sepsis. In hepatic abscesses all writers coincide in issuing a grave prognosis. The outlook, however, is not hopeless, as some would have us believe. The early recognition of the typhlitic focus is one step towards improving the prognosis. All portal infections, however, are not the result of thrombosis nor of emboli in gross; in some cases there may be repeated additions of bacterial emboli, a certain amount of which the liver is able to cope with. In such cases Gerster's thorough ablation of the appendix and the infected veins of the mesenteriolum would prove of value. A very suggestive case in this regard came to my notice a few years ago.

W. B., male, aged nineteen years, was seen at the Quincy Hospital in March, 1901. He had been ill with typhoid fever for five weeks during the preceding fall, but had recovered by January 1, since which time he had had attacks of pain in the bowels coming on about once a week. Two days before I saw him there was a sudden attack of typical appendicitis, followed within twenty-four hours by jaundice of the sclera and enlargement of the spleen. Under ether a gangrenous appendix was removed and the cavity drained. The jaundice at once cleared up and the patient recovered.

Despite the fact that when the septic invasion has obtained a foothold, the tendency of these abscesses is to assume the miliary type; they do not always invade all the lobes nor even the entire area of one lobe. Small abscesses tend to coalesce, and these again to unite with others to form often large cavities more or less surrounded by smaller foci. Abscesses that form by direct extension from the subphrenic, the peritoneal, or the retroperitoneal spaces are more liable to be circum-

scribed than those originating in the portal tract, and the former class gives a much better prognosis after drainage. Perutz, in reporting three recoveries in ten cases, states that the abscesses were single because infected through the retro-peritoneal cellular space.

The difficulty of adequate drainage is shown in a case reported by Abbadie. An abscess of the liver starting two weeks after a subsiding appendicitis was drained anteriorly by Dr. Bureau with temporary benefit. A month later, however, a second abscess was opened through the tenth interspace and pus found on the upper surface of the lobe. Nevertheless, death ensued two weeks later, and autopsy showed an abscess in the meso-appendix, abscesses following the portal branches, a cicatrix at the site of the first operation, and no abscesses in the left lobe.

The number of cases of recovery from hepatic abscess following surgical interference is very small, actually and proportionally. The fact that such may recover spontaneously by evacuation into some organ or through the skin indicates that with intelligent interference more cases could be surgically cured. Bosanquet, Dillard, T. J. Kelly, Jr., Richard, and others report cures by spontaneous evacuation. Sheen, Morton, Loison, and a few more have had similar good results by instituting drainage, so we need not submit to Dieulafoy's statement that all appendicular abscesses of the liver are fatal.

Cyr has shown that 25 per cent. of 500 hepatic abscesses of different origins perforated spontaneously, for the most part into the thoracic or abdominal cavities, and rarely into the intestines, pericardium, etc.

One of the most vital points in dealing with the obscure lesions that concern us here is to determine the source of the infection. It is not now difficult, in the light of modern work on the diseases of the appendix, to trace the infection to that organ where a few years past it would have been overlooked. Many histories of reported cases point with almost absolute definiteness to the mild or acute attack of appendicitis that is chronicled, but to which no weight has been given by the

reporter. In a majority of such cases of the last twenty years, where there has been any attempt at recording symptoms, the surprise is that the causative appendicitis was so easily overlooked. At the present time there is very little excuse for such an oversight.

The diagnosis of the lumbar phlegmon may be made first by recognition of a present or remote perityphlitis, the remoteness extending back for weeks or months, then by fever and malaise, sometimes chills, and spasm of the lumbar region which is practically always present. Later, a fulness and tumor may be felt by bimanual palpation. Marchand, with whom Piard apparently agrees, notes the insidious character of an infection when it takes place in the retroperitoneal space, and speaks of the mild type of fever that attends it. This is quite contrary to our experience. As a rule, the average case of appendicitis is not characterized by hyperpyrexia, so that if one of our patients does display an unusually high degree of fever, the first sign we look for is that of an invasion of the posterior lymphatics, and in not a few instances we have found definite indications that have yielded to one or another form of treatment.

When the infection has attained the subphrenic space, the symptoms are more varied, and are frequently impossible of interpretation without exploration or operation. To quote freely from Grüneisen, we must regard the subphrenic abscess as a circumscribed peritonitis, and hence we often find acute, gradually increasing signs of peritonitis. At times there is only dull pain; at other times the disease comes on suddenly with collapse, chill, vomiting, severe pain, etc. Sometimes the course is very obscure and the picture of the disease is not clear. Pain is inconstant. In most cases there is an elevation of temperature. On examination, we often find irregular marked arching in the lower portion of the thorax of the diseased side. This does not behave in respiration in a normal way. The intercostal spaces are obliterated, widened or bulged, and frequently painful on pressure.

Lejars often found a characteristic point of very intense

pain. The upper boundary of dulness often stands in a convex line, and above the dulness there is found normal lung resonance in case there is no pleural effusion. In some cases one can determine a marked change in the upper boundary of the dulness on inspiration. The change is small, chiefly because the diaphragm pressed upward is weak and lame. If there is gas in the abscess, then there is a clearly marked tympanitic zone to be recognized, which changes with the position of the patient. One finds characteristically from above downward, first, normal lung resonance, below this a sharply bounded tympanitic zone, and then a dull area, due to the presence of pus. This three-layer arrangement of zones can almost be taken as pathognomonic. In left-sided abscesses the heart may be pressed somewhat upward but not to the right, while in right-sided abscesses the heart is pressed very little towards the left. The liver and the stomach may be forced down to a considerable degree.

In a fair number of cases it is impossible to make an absolute diagnosis of subphrenic abscess. The previous history which indicates primary disease in the abdominal organ or in the respiratory organs is of importance. With a sudden rise of temperature in such cases, one must consider the possibility of subphrenic abscesses among other complications. To distinguish from an encapsulated basal empyema may be impossible. Here the preliminary history is often of great assistance. Where a subphrenic abscess without gas coexists with an already well-marked pleural effusion, a diagnosis is impossible, or is made only accidentally; when, however, in such cases the abscess contains gas, the limited area of tympany is of great assistance in making the correct diagnosis.

The determination of pus by means of the exploratory needle is an important aid in the diagnosis of deep-lying pus cavities. Puncture is best made in the region of most marked dulness through the ribs, and in the region where, in case of finding pus, one would eventually operate. Often one must make more than one puncture. In one case Grüneisen reported thirty-six trials at several sittings.

Various modern writers advocate the X-ray as a means of locating these abscesses about the diaphragm, and the following case of ours demonstrates its usefulness most conclusively.

W. E., male, twenty-six years old, seen August 2, 1902, was referred to me by Dr. V. Y. Bowditch, to whom he had been sent with a diagnosis of tuberculosis. In the early part of June he had had a sudden attack of appendicitis lasting for a week with slight jaundice. After cessation of the pain he was able to get up, but was very weak; three weeks after the onset he complained of pain in his right lung. He then entered a hospital, and the right chest was aspirated with negative results.

Examination of the lung in August showed an occasional snapping râle here and there on both sides. There was neither jaundice nor a history of definite chills. He had lost about twenty pounds, was septic looking and anæmic. There was bulging of the right lower chest, the edge of the liver being a little below its normal position. He was advised to enter the Boston City Hospital at once. A diagnosis of subphrenic or hepatic abscess was made.

August 12, under ether, a trocar was passed through the right chest into the margin of the liver without showing pus. A portion of the ninth rib in the scapular line on the right side was removed. Fine recent adhesions were found in the lower part of the pleura, but neither fluid nor pus was found. The diaphragm was opened and the subphrenic space explored as far as the finger could reach. Still no pus was found, even when a director was passed into the liver in various places. The wound was packed and patient sent back to bed.

He continued to lose ground steadily, and about a week before my second operation he had a sudden and violent coughing fit and spat up some foul, stinking fluid. For a day or so his death was hourly expected, but again he rallied. All this time we were confident that there was infection in the region of the diaphragm, and, although most careful physical examinations were made by various experienced diagnosticians, at no time were they able to locate the trouble with enough accuracy to encourage further exploration. Finally, on September 26, X-ray examination having accurately shown below the diaphragm an abscess cavity which

pushed the diaphragm upward, the patient was given chloroform, and a cross incision was made over the sixth right costal cartilage near its junction with the seventh. The upper surface of the diaphragm presented, but the pleural space was not opened. Upon perforating the diaphragm, a cavity was entered which extended posteriorly apparently over the entire right lobe of the liver. It contained gas and a considerable quantity of very foul, thin pus. A small band of adhesions towards the under surface of the lung suggested the location of the perforation into the lung. The liver was drained and iodoform wicks were put in. No direct communication with the liver could be determined.

After operation there was profuse drainage of pus with a fæcal odor, but the patient was already too septic to rally, and he died at the end of three weeks. No autopsy could be obtained.

To diagnosticate a typical case of portal pylephlebitis should not be very difficult. One of our cases illustrates so significantly the characteristics of the early stages, that I will report it first of all, as a basis.

T. S., female, seventeen years old. Ten days before entrance to the Boston City Hospital she had an attack of sudden sharp pain in the region of the umbilicus, with vomiting which continued for two days. Four days before entrance she began to have dull continuous pain just below the costal margin, followed by chills and sweating. The white count was 8800. She was in the hospital two days before operation, and grew distinctly worse during that time. There was very slight jaundice, noticeable only on careful examination; fulness through the right hypochondrium into the flank, with spasm and tenderness over the liver. There was nothing to call attention to the appendix except a distinctly local tenderness on deep pressure, without spasm; this had been overlooked by several previous examiners.

A diagnosis of portal phlebitis following appendicitis was made, and under ether the abdomen was opened over the right lobe of the liver, spasm persisting even under anæsthesia. On the upper surface of the right lobe there were three or four groups of small abscesses. These were incised, and the liver itself opened up freely with the director and finger, but no more abscesses could be found. The left lobe was normal in size.

Various punctures were made elsewhere in the liver without obtaining any more pus. Through a second abdominal opening a foul, stinking abscess cavity surrounding the appendix was opened and drained. Two days later the appendix wound was clean and sweet. Foul pus was escaping from the liver and the packing was removed without hæmorrhage.

On the third day, in the afternoon, the pulse suddenly rose to 160; the patient became unconscious, and, although stimulated with salt solution, etc., did not react. On the following day she was more or less delirious, with considerable discharge from the liver which seemed to be mostly bile, and five days after operation she died. No autopsy was obtained.

This can be taken as a typical example of a case seen and operated upon early. In more advanced or in atypical cases the grouping of symptoms is almost without limit, but, as a basis, we can almost always discover the definite history and signs of appendicitis, the fleeting jaundice, the hepatic pain, tenderness and enlargement, chills, and rapid emaciation.

To consider a few symptoms in detail. Jaundice is present in some degree in a majority of cases. It is frequently overlooked, as it may not exhibit itself elsewhere than in the sclera or urine. It is not often as pronounced as in cases of common duct stone. One of my cases, however, that I saw with Dr. Jackson, and which he has reported, had deep jaundice, but that is apt to be the exception. Of 80 cases reported individually within the last twenty years I find that in 34 there is definite mention of the presence of jaundice, while in 6 it is especially noted as being absent. Of the 40 in which no mention, one way or the other, is made, many of the clinical histories are very imperfect; so that it is safe to conclude that where the examinations are carefully carried out we will notice jaundice at some stage.

Chills are apt to be one of the earlier signals of the beginning portal infection. They may or may not be repeated, and rarely show enough regularity to make confusion in diagnosis with malaria justifiable.

Pain in the hypochondrium is important, and, according

to Abbadie and Reichardt, it is one of the most characteristic symptoms. It usually precedes the jaundice, or it may accompany it. With the pain we are apt to find attacks of vomiting, but the latter is not likely to persist, especially in the chronic type of case. In the acute cases it is sometimes persistent and intractable. Diarrhœa is not uncommon, but it is not necessarily present. Jourand reported a case ushered in by acute vomiting, intractable diarrhœa, and high fever, but the originating attack of appendicitis was probably responsible for this group of symptoms.

Soreness of the liver accounts for the stooping position that patients assume when walking, and for their lying on the right side with adduction of the thigh.

With the enlargement of the liver we may find an enlarged spleen, but it must not be confused with a left lobe irregularly swollen, nor must the tumor in the right hypochondrium be ascribed to swelling of the right lobe necessarily. Dyspnœa naturally is found with the swollen, tender liver.

Graham reports a case of suppurative gangrenous splenitis, originating in appendicitis, where, though there were no abscesses in the liver, the branches of the portal vein were full of pus.

The temperature, taken either hourly or twice daily, shows irregularity, and frequently makes wide excursions. This characteristic, together with a rapid pulse, should be a strong factor in ruling out typhoid even in the presence of a Widal reaction. The high pulse is often characteristically dicrotic. (Reichardt.)

The mental condition varies generally with the type of case. For the most part, since cases of this infection are more or less chronic, averaging from thirty to forty days (Abbadie), the sensorium is clear up to death, but in the acute types we must except somnolency, delirium, and coma. The comfortable mental condition of many of my own cases has been most impressive; suffering, except that from some extraneous cause, has been practically absent.

In a few cases we may expect hæmorrhages from the

different mucous membranes. Distention of the superficial veins is occasionally seen, and in several of my cases there has been a local œdema of the parietes in the region of the hepatic foci.

A friction rub can be occasionally heard over the dome of the liver; it is not pleural in origin, but is due to the rubbing together of the inflamed peritonitic surfaces. The emaciation of the patient in chronic cases is very marked, and takes place in spite of voracious appetites and abundant feedings.

In children, gastro-intestinal symptoms are manifest both at the outset and during the progress of the disease. Convulsions, delirium, and other nervous phenomena are also found.

Petechiæ and purpura are occasionally reported in severe cases. The enlarged and thickened portal vein was felt once by Schoenlein as proven at autopsy. We rarely find evidences of metastasis in distant organs to aid or obscure the diagnosis.

The treatment in the various conditions considered here is surgical. When the lymphangeitis is limited to the tissues in the neighborhood of the cæcum or in the perirenal region, extraperitoneal openings may be made alongside the iliac crest or in the loin. When the infection is in the subphrenic space, it may be attacked through the intercostal spaces, by resection of one or more ribs anteriorly or posteriorly, or by the lumbar route, as the case may require.

Stone regards every delayed case of appendicitis with anxiety, and, when chills and other symptoms point to a complicating sepsis, he advocates treatment of the retroperitoneal space, and considers it as important as that of the intraperitoneal. Were this done early in such suspicious cases, we would undoubtedly escape some of the direful accidents that follow the retroperitoneal infections.

As a rule, it is best to attack the infections by the shortest route when that can be determined by swelling, local tenderness, X-ray examination, etc. The trocar may be used for locating the pus, and retained as a guide for an immediate incision.

In resecting a rib or ribs it makes little difference whether it is done anteriorly or posteriorly, so long as the indications point to one or the other route. The pleura, if it lies in the track of operation, may be stripped back, or sutured so as to prevent collapse of the lung and soiling of the pleural cavity; or it may be packed off with gauze and allowed to form adhesions and the diaphragm opened at a second operation. It is best to resect some rib below the eighth.

Anteriorly, Fox and Russell advise splitting the rectus at about its chondrocostal junction, exploring from this opening, and then, if a transpleural opening is required, resecting a portion of the rib through an incision extended backward along its convexity.

Lannelongue resects a triangular portion of the chest wall anteriorly and attacks the subphrenic area from this point.

To attack the intrahepatic collections of pus, one may make use of thoracic resection as in subphrenic abscess, or he may open up the abdomen freely and explore the liver under the guidance of sight and touch. By careful gauze packing there is little danger of peritoneal infection. Israel and others, in cases of pus collections situated in the outer posterior part of the right lobe, open alongside the twelfth rib, turning it and the kidney to one side, and incise the liver in the neighborhood of the renal depression.

To explore the liver itself, I much prefer two grooved directors. As soon as pus is located, the interior of the liver can be freely explored and broken up with the finger; all bleeding, even if it looks alarming for a few moments, is quickly stopped with gauze tamponade. The methods proposed for suturing the liver to the parietal peritoneum previous to exploration are difficult and useless.

In conclusion, I would make the following suggestions: first, lymphatic and hepatic infections are more common than we realize. Second, the two infections are frequently associated, and one type may be the source of origin of the other. Third, in certain cases of hepatic abscess, the source of infection, whether through the portal canals or through the

lymphatics, cannot be determined either clinically or at operation. Fourth, the type of infection does not depend upon the gravity of the originating appendicitis. Fifth, subphrenic infections must not be isolated in a class by themselves, as they depend on both lymphatic and hepatic infections, and *vice versa.* Sixth, hepatic infections are not uniformly distributed even when originating in the portal tract, the left lobe being solely affected at times. Seventh, the prognosis of lymphatic (including the subphrenic) infections is better than that of hepatic, but, when the latter are secondary to lymphatic or direct mechanical invasion, the outlook is more favorable than in the true portal invasions. Eighth, the most important clue in making a diagnosis is the recognition of the causative appendicitis, and the elimination of this possible cause is necessary in dealing with obscure hepatic invasions in the presence of plasmodia, the Widal reaction, etc. Ninth, early recognition and removal of the inflamed appendix may abort a secondary infection of the type considered here, but the corollary does not necessarily follow. Tenth, the characteristic signs and symptoms are well established in typical cases, and should form a basis for diagnosis in atypical cases.

PAROTITIS FOLLOWING APPENDECTOMY.

BY EDWARD BOWE, M.D.,

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IN the December, 1904, number of the ANNALS OF SURGERY, Brennan Dyball reviewed the literature and discussed the probable etiology and pathology of parotitis secondary to operative procedure upon the pelvic and abdominal viscera. Therefore, it is not the purpose of the writer of this paper to deal with this phase of the subject, except in comparing observations and arriving at conclusions from a study of the following two cases:

CASE I.—H. B., aged thirty-four years; occupation, teacher; family history negative; personal history, had the acute diseases of childhood (including acute parotitis); had an attack of appendicitis one year previous, was relieved by medical treatment; was admitted to Our Saviour's Hospital giving a history of an illness of twelve hours' duration, diagnosis, recurrent appendicitis. Operative procedure confirmed the diagnosis, the wound was closed without drainage, and the patient returned to bed in excellent condition. During the four days following the operation the patient's condition evidenced an uneventful recovery, but upon the fifth day he complained of pain in the region of the right parotid; examination revealed a slight swelling, which progressed, remaining confined to the parotid until the tenth day following the operation, when incision was made into the parotid and a quantity of pus evacuated; the wound was drained and allowed to close by granulation. At no time following the operation was there any indication of pus at the site of the abdominal wound. Patient was discharged cured at the end of five weeks.

CASE II.—C. C., aged twenty years; occupation, student; family history negative; personal history, had the acute diseases of childhood (including acute parotitis). Present illness was directly traceable to an injury received in a foot-ball game three weeks previous to being admitted to Our Saviour's Hospital. At

the time of injury, the patient was removed from the field, and for some time allowed to lie upon the ground exposed to the inclemency of the weather. Examination revealed tenderness and tympanites over the lower half of the abdomen, with marked tenderness at McBurney's point; a diagnosis of appendicitis was made and operative measures advised. My colleague, Dr. J. W. Hairgrove, was called as a consultant and confirmed the diagnosis and, with my assistance, operated upon the patient. Immediately upon opening the abdomen, there was evidence of a diffuse inflammatory condition; the appendix was reached with great difficulty; the wound was drained, and the patient returned to bed in fair condition; the bowels moved freely twelve hours following the operation, and continued to do so until death, upon the fifth day. While there was marked evidence of peritonitis at the site of the wound, I am reasonably certain that it was localized and the drainage was adequate. During the third day following the operation, the patient became restless, complained of an intense thirst, and at intervals was slightly delirious. The abdominal wound was examined and found to be in a satisfactory condition. Four hours from this time, I was called, and found the patient in a most distressing condition. There was a marked increase in the pulse-rate, rapid respiration, a semidelirious restlessness, and in the region of the right parotid was a pronounced swelling; this swelling was not confined to the parotid, the adjacent tissues being early involved. The left parotid soon became involved in a similar manner, and from these foci of infection I have never seen a more rapidly extending inflammatory condition than followed; the tissues of the neck and face became rapidly involved; the patient assumed a most unsightly appearance; the symptoms of septicæmia became more and more pronounced, and death occurred early on the fifth day following the operation.

It is needless to consume space in discussing the theories and observations of others regarding secondary parotitis; Dyball has so recently and ably disposed of this part of the subject that I now wish to simply add my conclusions.

I believe parotitis secondary to traumatism or disease of the abdominal or pelvic viscera to be due to infectious material conveyed by the blood-stream from the primary focus of

infection to the parotid. The locus minoris resistentiæ is explained by the fourth statement in the classification of reflex actions by Kuss. "Those in which both centripetal and centrifugal nerves are of the sympathetic system, as, for example, the obscure actions which preside over the secretion of intestinal fluids, those which unite various generative functions and many pathological phenomena."

ACUTE GANGRENOUS APPENDICITIS IN TYPHOID FEVER SIMULATING PERFORATION.[1]

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CARRIE C., aged twelve years, was admitted to the Medical Wards of the Presbyterian Hospital on March 6, 1905, under the care of Drs. Musser and Talley. Her history was as follows:

Family history negative. Previous medical history included a severe attack of diphtheria seven years ago. For two years she has suffered with attacks of what were called "indigestion," which were accompanied by vomiting and severe abdominal pain lasting for from several days to a week, and of increasing severity. In view of her subsequent history, their relation is of importance. About the middle of January she was observed to be very languid, had no appetite, and complained of pain in the head and back, sometimes also in the abdomen. She developed a cough, and the sputum was said to have been blood-tinged. For several days before admission she had been quite ill.

On admission her face was rather pale; tongue clean; lungs negative; heart, first sound not entirely clear, valvular sounds sharp; spleen palpable; a few rose spots on abdomen; abdomen soft, flat, and not tender. Temperature, 102° F.; respiration, 36; pulse, 112. Urine negative and normal.

For the next few days the temperature ranged from $100^{2}/_{5}°$ to $103^{3}/_{5}°$ F., with marked daily remissions. The diazo and Widal examinations were positive. The treatment consisted of liquid diet, sponges, and hot mustard foot-baths for the control of fever. Whiskey, ℥ i q. d., was added on the 9th of March. So far the case had pursued the course of an ordinary typhoid of moderate severity. Abdominal symptoms of severity had been absent. There was no diarrhœa.

On the 9th of March the temperature reached $104^{4}/_{5}°$ F. at 11 P.M., and then began to drop after a sponge. At 5 P.M. of the

[1] Read before the Philadelphia Academy of Surgery, May 1, 1905.

10th it was 103° F. Another sponge was given, bringing it down to $101^{4}/_{5}$° F.; and at 8 A.M. it was $100^{3}/_{5}$° F., an assisted drop of $4^{1}/_{5}$ degrees in nine hours. In the meantime, however, at 6.30 A.M., she was suddenly seized by violent pain in the right side of the abdomen, extending from ribs to pelvis, and had a slight chill. The pain, which was paroxysmal, continued for about two hours, when she vomited, and had a bowel movement, after which she was more comfortable. The abdomen was not distended but slightly rigid, more so on the right than on the left side, and there was a point of marked tenderness in the right iliac fossa.

When seen at noon she was quiet, not complaining of spontaneous pain, tender over the abdomen on both sides, especially the right, with a rigidity also generalized, but most pronounced in the lower right quadrant, and increasing its area from hour to hour upward towards the costal region. At 11 A.M. the temperature was still as low as 101° F.; respirations, 48; pulse, 156, but of fair volume and strength. The facial expression was good. A leucocyte count made on the 8th, two days previous, showed 3600. Four hours after the onset of the pain, the count was 10,800. A diagnosis of perforation of the intestine was made from what seemed fairly typical symptoms. The sudden onset of pain, the vomiting, the increasing abdominal tenderness and rigidity, with a rising leucocyte count, and rapid pulse seemed to warrant such diagnosis. The drop in temperature was not as rapid or as extensive as is often seen in perforation. Vomiting had ceased, and pain was not complained of except on examination. Peritonitis, however, was evidently spreading.

The patient was operated upon eight hours after onset of pain. Ether anæsthesia. Lateral incision, outer border of right rectus. Much free cloudy fluid in peritoneal cavity. The ileum was hooked out and rapidly gone over upward and back again for perforation, but none was found. Mesenteric glands much enlarged. The appendix was then brought into view, seen to be gangrenous in its distal portion, removed, and found to be perforated and containing a concretion. Free abdominal washing with salt solution brought much cloudy fluid from the pelvis. Tubular and gauze drainage was inserted in pelvis and loin space. The time of operation was twenty-five minutes, some time being lost in examining the ileum, and more consumed in careful washing.

At the conclusion of the operation the pulse was 180, but the patient soon reacted under free stimulation and hypodermoclysis. The temperature continued to decline until 4 A.M. of the following day, when it touched 98° F. Thereafter the surgical condition gave little anxiety. The wound did well, draining freely at first, later granulating slowly. Abdominal symptoms quickly ameliorated. The patient's general condition improved rapidly at first, and then continued typical of a typhoid infection. The temperature rose again and was $102^{3}/_{5}$° F. on the evening of the second day after operation, and then ranged between 99° and 102° F. The pulse continued good under free stimulation. On the 18th the temperature touched $98^{3}/_{5}$° F., and then declined to normal more rapidly. Fourteen days after operation it became and remained normal.

The appendix when examined was found to be much inflamed, gangrenous for about two-fifths of its length in the distal portion; the mucous membrane inflamed throughout, and with a large concretion incarcerated in the gangrenous tip. At this point there was a small perforation. No typhoid ulcers of mucous membrane. Cultures gave abundant staphylococci.

The influence of typhoid fever on the appendix, and the occurrence of inflammations of that organ during and after typhoid fever, have attracted considerable attention, especially during the last few years, and it seems to be well recognized that the appendix often shares with the intestine in the pathological lesions, although in a varying degree. Among the pathological lesions noted are swelling and rigidity of the organ, congestion, peritoneal exudate of fibrinous character, infiltration with cells typical of the typhoid process, various lesions of the mucous membrane of an inflammatory or ulcerative nature, from simple swelling to superficial, deep, and perforating ulcerations, and complete necrosis. In addition to those cases of "typhoid appendicitis" in which such typhoid lesions are present, and in which the symptoms depend upon them alone, there seem to be one or more varieties of appendicitis which occur in the course of typhoid fever, in which the pathological process is practically identical with that observed in appendicitis occurring in the otherwise healthy individual. Kelly and Hurdon, in their book on the "Vermiform Ap-

pendix and its Diseases," have entered rather thoroughly into a study of the subject, and have attempted to classify the cases pathologically and clinically. In their pathological classification they make the following three types:

1. Those in which the appendix participates in the typhoid lesions.

2. Those in which a secondary infection with pyogenic organisms is engrafted upon the typhoid infection.

3. Those in which a simple appendicitis develops, the appendix not being involved in the typhoid infection, but in which it is probable that the attack is often precipitated by the congestion which accompanies it, without necessitating any specific typhoid lesions.

As to the frequency of these lesions, they add that the appendix is involved in one-third of all cases of typhoid fever, and that of the perforative cases there is a perforation in the appendix in 5 per cent. (Some statistics give a little higher, others a lower percentage than this.) They believe that the second class, viz., that due to typhoid lesions, associated with a secondary infection, furnishes a large proportion of the cases of acute perforative appendicitis occurring in typhoid fever. As to the third type, they cannot estimate its frequency, but point out the deleterious influence which the hyperæmia attending the disease might be expected to exert upon a kinked, stenosed, chronically inflamed organ, perhaps containing a concretion.

The clinical classification which Kelly and Hurdon make differs a little from the pathological classification. It is as follows:

First group. Accidentally associated appendicitis, or a rousing into activity of a latent or chronic inflammation by typhoid fever.

Second group. Appendicitis of mild or severe type arising from typhoid affection of the lymph-glands, or ulceration of the appendix.

Third group. Appendicitis following typhoid fever within such a brief time as to suggest strongly a chance relation.

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Kelly's and Hurdon's studies have apparently led them to the belief that the large majority of cases so far reported have been cases in which the typhoid process has been the main feature in exciting the appendiceal inflammation. They have encountered no case in a child where the appendicitis has developed in the course of typhoid fever. In our case, the history of recurring attacks of a painful type of so-called "indigestion" within the last year, the appearance of the appendix at operation, the presence of a concretion, and the results of the examination by the pathologist, make it very probable that it was one of the chronic or relapsing variety roused into activity by the hyperæmic and favoring conditions of the enteric attack, but not depending for its origin on any special typhoid lesion.

The question of diagnosis is of some interest. This case was mistakenly diagnosed as one of typhoid perforation. Perforation it was, but of another type, and which would presumably be associated with its own peculiar train of symptoms. We have already described the symptoms present, and mentioned one or two in which it differed in degree or kind from those typical of perforation. The condition, however, called for operation as strongly as if an anatomically and pathologically correct location of the lesion and its character had been arrived at, information desirable to obtain beforehand where possible, but of infinitely less importance here than the procedure for its relief. We believe that the rapidity of the process in this case is exceptional, even for appendicitis in a child, in whom we know by recent studies that the process is apt to be more rapid and more insidious than in adults. There is not usually much difficulty in distinguishing between appendicitis and perforation in typhoid fever, as Deaver emphasizes. As he states, the shock is not so great, the change in pulse-rate is not so rapid, the fall of temperature is infrequent, and the course when watched and not operated upon is not so rapidly to a fatal termination. In our case, there was a fall of temperature, but it came about the same time that the daily decline usually occurred, and it did not drop as suddenly nor go as low as the temperature usually does during

perforation, and hence, while it was pronounced enough to invite further study, it lent one of the few doubtful features to an otherwise apparently clear case of perforation. In every other respect the distinguishing features between the two conditions, as cited by Deaver, would have lamentably failed.

The advisability of operating for appendicitis during the course of typhoid fever is one which naturally has the keenest interest for the surgeon. We often hear it stated in discussions on typhoid perforation that laparotomy is well borne in typhoid fever. But certainly since, and possibly before, Maurice Richardson pointed out the difficulty of diagnosing between some atypical cases of typhoid fever, especially at the beginning of the attack, and some cases of appendicitis, and the humiliation involved in a needless operation for the one, as well as the dangers of a delayed operation in the other, and since the same distinguished surgeon has asserted the truth of the statement that operations in typhoid fever, even those of themselves comparatively slight, have a high mortality, we find some of our most radical surgeons emphasizing the necessity of caution in this field. In the early stages of the disease operation is nearly always successful; but even here it may form a complication which later on will seem to be unfortunate. Hence it is that we find Kelly advising a waiting policy unless the symptoms are exceedingly urgent; Murphy counselling against operation unless perforation has taken place; and Deaver, in his latest word on the subject, saying that, while in the early stages the result of operation is nearly always favorable, later the operation may be a serious complication, and even cause a fatal result. Hence he favors temporizing where possible where appendiceal inflammation develops after the third week is under way, and operation after recovery from the fever. Deaver strongly advises against operating during the height of the disease, except for pus or perforation, and quotes Harte's and Ashhurst's statistics of operation for typhoid appendicitis. Of twenty-six cases which they collected, seven died, the mortality being heaviest from the second week onward.

JABOULAY'S ANASTOMOTIC BUTTON.[1]

AN EXPERIMENTAL STUDY.

BY EDWIN BEER, M.D.,

OF NEW YORK,

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THE purpose which I had in view when I undertook the following study was to ascertain whether the new anastomotic button, designed by Jaboulay, Professor of Surgery in Lyons, was superior to other mechanical contrivances at present employed. The opinion of the Lyons clinic was very naturally highly favorable, and Jaboulay and his assistant, Gayet, speak of the new button with unstinted praise.

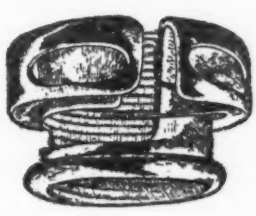
At the present time surgeons are more and more of the opinion that an anastomosis made by suture is preferable to one made by any mechanical contrivance. Still, there are cases when, to save time, to prevent shock, etc., the greater safety and reliability of the suture method must give way to the use of the mechanical contrivance. Up to the present time, the only contrivance which has been universally approved of, and which has become a favorite and necessary part of every surgical equipment, is the button invented by Murphy. Jaboulay's button is to displace the button of Murphy, and in the following pages I naturally will have to compare these buttons and their relative advantages rather than enter into any comparison between the well-accepted methods of anastomosis by suture and the anastomosis that can be effected by the new button of Jaboulay.

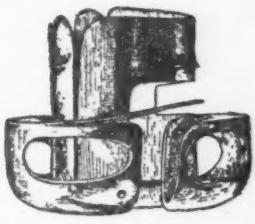
Some years have elapsed since the new button was described. In construction it resembles superficially the button of Murphy, but its principle is quite different. Instead of introducing each half of the button through an opening in

[1] From the Surgical Laboratory of the College of Physicians and Surgeons, Columbia University.

the bowel, proportionate to the largest diameter of the button, and then closing the incision to either side of the inner cylinder of the button by suture, *Jaboulay thought he could make use of the screw and key-ring principle and introduce the halves of his button through a very small opening, thus avoiding all use of sutures.* A button introduced in this way naturally would be placed *in situ* very much more rapidly than a Murphy button.

To understand the mechanism of the new button, I must describe its peculiarities. For purpose of description, I shall take the button of 22 millimetres diameter. As seen in the





illustration, the button consists of two halves, a male and a female. Each half is made up of two cylinders, an outer and an inner. The outer is perforated with drainage holes just as in the Murphy button, though the openings are of a different contour. At one point in the outer cylinder there is a distinct break in the continuity of this cylinder; this gap or slit is prolonged into the inner cylinder and continues almost half-way round the inner cylinder. It measures in a 22-millimetre size button approximately one-eighth the diameter of the button. It is vertical in the outer cylinder, running through its entire thickness; whereas in the inner cylinder it at first is vertical, corresponding to the slit in the outer cylinder, but very shortly bends at right angles and runs, as said above, almost half the way around the inner cylinder. In this slit the Jaboulay idea is concentrated. By means of this slit the button can be introduced into the lumen of the bowel through a small opening. Naturally, the same slit arrangement is present in the male and female halves of the button, and these

fasten into each other by means of a screw-thread arrangement somewhat similar to the mechanism of the Murphy button. As the outer cylinder has been interrupted by the slit which runs through it, to obtain approximation of the two pieces of bowel at this point when the buttons are driven home, Jaboulay had to prolong the mesial margins of the outer cylinder, *i.e.*, the margins which come into contact with each other when the buttons are approximated, otherwise there would be leakage at this point. The prolongation of this margin is in the form of a thin, elongated metal plate, which acts like a weak spring in closing the slit in the upper or mesial border of the cylinder. The extra cylinder of the Murphy button, which works on a spring and whose function is to force and hold the two apposed serosa surfaces against each other and eventually produce their necrosis, is not used in the Jaboulay button. In this button the apposition and subsequent necrosis are produced by the operator's forcing the two halves of the button very firmly together.

The technique of introducing the button as described by Gayet is as follows:

To introduce a button whose largest diameter is 22 millimetres, an incision into the bowel 1 centimetre in length is required. The half of the button held by the inner cylinder by a clamp is brought to the incision, and the lip of the slit in the outer cylinder is introduced into the lumen of the bowel by a screw motion. At first the long diameter of the outer cylinder of the button is perpendicular to the opening of the bowel, and to the surface of the bowel, gradually, however, the above diameter is made more and more nearly parallel to the surface of the bowel, and the button is screwed into place, the entire outer cylinder entering the lumen of the bowel. The button is securely held in place, primarily because the small opening in the bowel fits its inner cylinder snugly; secondarily, by the fact that the lip of the incision in the bowel prolapses into the slit which runs about half the way around the inner cylinder. After placing each half of the button *in situ*, the two parts are driven home with considerable force to make

sure there is no chance of leakage, and that the button will cut through and free itself by producing the necessary necrosis.

Jaboulay has used his button 200 times in intestinal, gastric, and gall-bladder operations. On the whole, he is very well satisfied with it. He claims that he can introduce it much more quickly than the Murphy button. Recently (*Centralblatt für Chirurgie*, 1904, p. 1195) he said that in favorable cases he can make an anastomosis in two minutes. He claims, also, that with perfect buttons the results are excellent and the procedure is perfectly safe.

Two questions naturally suggest themselves at this point. Can the button really be screwed into the bowel through a small incision? Does the button cut its way out of the anastomosis? To answer these most important questions, I undertook the following experiments after procuring six of the Jaboulay buttons from Lyons.

Before giving my results, however, let me see if we can find any answers to the above questions in the publications of Jaboulay and Gayet. Both declare that a button of the size above described can readily be introduced through a 1 centimetre incision, if the above directions are carefully followed. The gradual change in the relation between the diameter of the button and the surface of the bowel as the button is screwed into place, Gayet thinks the essential factor in introducing the button without tearing the incision. Still, if we scan carefully the incomplete reports of the few cases in his paper, we see that in Case 31 operated by Jaboulay there was a tear one-half inch long which required a suture; in Case 78 operated by Gayet there was a similar tear. How frequently the above surgeons produced tears, I cannot tell from these reports. Still, it is evident that the button, even in their hands, cannot regularly be screwed into place without tearing the bowel, and necessitating sutures.

In the fourteen anastomoses that I made in dogs I found that, though the button was easily screwed into place, I very frequently produced tears which, as far as I could see at the time of operation, involved only the serosa. In fourteen an-

astomoses I naturally used twenty-eight pieces of bowel and introduced twenty-eight halves of the buttons. In eighteen of these I tore the incision in screwing the button into place. All of these required one or more silk sutures to close the rent. In no instance, however, did the mucosa prolapse through these tears, as it does through the larger incision used in the introduction of the Murphy button.

I said above that at operation these tears apparently involved the serosa alone, but later on I shall call attention to a fact found at autopsy which forces me to conclude that the other layers of the bowel are torn more or less frequently.

These data go to show that the introduction of the Jaboulay button without producing lacerations requiring suture is by no means a regular procedure. In view of the fact that the purpose of this button is to avoid all suturing, it is evident that it does not meet the demand.

A careful examination of the button will readily explain why the introduction of the button is liable to tear the incision in the gut, for the tears, as will be seen, are actually caused by stretching and divulsion of the small incision. If the button is followed as it is screwed into the bowel, one notes that at first it screws in very readily, but as soon as half of the outer cylinder is in place a distinct resistance is encountered. The slit in the outer and inner cylinders which runs not quite half-way round the inner cylinder permits the ready introduction of the corresponding half of the outer cylinder. However, as soon as the end of the slit in the inner cylinder is reached the incision in the bowel is held fast at that point, and the incision itself is stretched to permit the outer cylinder to enter the bowel. This stretching must accommodate more than the largest diameter of the button that is still outside of the lumen. The stretching must equal in length the distance from the end of the slit in the inner cylinder around this cylinder to the tip of the spring-like plate which serves as the prolongation of the mesial surface of the outer cylinder, for the incision does not accommodate diameters; it is forced by the construction of the button to accommodate circumferences.

The distance measured from the end of the slit around the inner cylinder to the end of the plate-like prolongation on the mesial rim of the outer cylinder in a 22-millimetre button is approximately 33 millimetres. Thus the original 1 centimetre incision in the bowel is stretched to over 3 centimetres to permit the introduction of the button. This excessive stretching naturally tears the wall of the bowel and defeats in this way the very purpose of the button.

In dogs, in eighteen out of twenty-eight instances, the button's introduction produced serosa tears. Whether in the other ten cases tears were produced below the serosa I cannot say, though, judging from the behavior of the other coats of the intestine when the bowel is overstretched by distention, one might be inclined to deny tears in these cases. Jaboulay's and Gayet's cases mentioned above show that similar tears occur in the human bowel, and such was to be expected, seeing how the construction of the button has really defeated the purpose of the inventor.

Are these tears a great drawback and danger? In my cases I saw no bad result from them, though theoretically everybody will picture to himself serious possibilities, which these tears carry with them, especially when one realizes that the button may remain *in situ* indefinitely. From the few cases reported in some detail by Jaboulay and Gayet, I was unable to detect any serious results that were attributed to these tears. They had 18 per cent. mortality in their series of gastro-enterostomies for carcinoma ventriculi, and of the eighteen deaths four were due to peritonitis,—two of these were due to leakage from the button and two were due to some cause which they omitted to mention. Possibly the divulsion of the incision had some relation to some of their peritonitis cases!

From the above remark, it will be clear that the button is liable to tear the small incision, even though that is not a regular event. If the button could be regularly introduced into the human bowel without tearing the wall of the bowel, a feat which I fear is very improbable in view of the construc-

tion of the button, it would mark a decided advance over the Murphy button as far as the question of the introduction of the button is concerned; for then not only could the button be placed *in situ* more rapidly, but no sutures would be required, and the danger of soiling the peritoneum would be reduced to a minimum, for the button, while being screwed into the bowel, acts as a plug, closing the incision completely. Even as it is, despite the tears produced, the button is in some respects superior to the Murphy button, always considered from the stand-point above taken, that of the introduction of the button. In other points it is inferior to the Murphy button, and consequently, in my opinion, will never displace the older contrivance except in individual cases where greater rapidity of work is absolutely essential. It is much more quickly introduced into the bowel, and the operator is never troubled by the prolapsing mucosa which is often so annoying when the Murphy button is used. Another advantage over the Murphy button is the fact that the button is held more firmly in the incision by the walls of the gut, and the operator need not rely on sutures to grasp the button. These distinct advantages of the button are, however, outweighed by the disadvantages which will be discussed in answering the second question propounded above.

Does the button cut its way out of the anastomosis? I said above that the force that drives the Jaboulay button home is the effective element in producing the necrosis of the gut that intervenes between the outer cylinders, and thus the liberation of the button. The force used naturally must be fairly great; but even when I pressed as firmly as I could, with cotton sponges as buffers between the gut and my fingers, the button was not regularly eliminated. The pressure that was necessarily employed at times produced small hæmatomata in the wall of the gut. I say necessarily, because, prior to exerting this excessive pressure, I found that, on testing the anastomosis by forcing the gastric contents through the button into the temporarily obstructed gut, an escape of gas bubbles at the anastomosis became evident. From such a leakage Jaboulay lost two patients.

In this pressure, which is necessary both to prevent leakage and to produce the necrosis prior to the passage of the button, I find one of the disadvantages of Jaboulay's button. Murphy met this difficulty by the use of the third cylinder in the male button, which works on a firm spring, obtaining both complete apposition and the necessary necrosis without use of any great pressure by the operator.

As might be expected, in view of the fact that the elimination of the Jaboulay button depends entirely on the amount of pressure exerted in driving the buttons home, the button frequently remains *in situ*, carrying with it dangers of ulceration and obstruction, etc.

In Gayet's recent paper he says, " in a very large number of the cases the button is not passed, either remaining *in situ* or falling into the stomach." (*Revue de Chirurgie*, page 474, 1904.)

Jaboulay's recent statements are less direct on this point, so that I cannot ascertain whether the button remains in the anastomosis most of the time or not. He says in one-third of the cases the button remains in the stomach. How many are free and how many firmly fixed, he does not say.

In my cases, of which twelve anastomoses were available for this purpose, eight out of the twelve buttons were passed. In these, one-third of the buttons remained in the anastomosis. Autopsy showed me why the buttons remained *in situ*. Two factors contributed to fixing the button in the anastomosis. Either insufficient tissue between the outer cylinders had been cut out by necrosis or the drainage holes had been filled with masses of thickened mucosa, which frequently ran into one such hole and out of the next one, making a loop from gastric wall to gastric wall through the button. The insufficient necrosis was occasioned by insufficient pressure, though I employed practically all the strength that I could bring to bear with thumbs and fingers of both hands. The entanglement of the mucous membrane in the drainage holes, I can explain in only one way, namely, by assuming that the mucosa was torn when the button was originally introduced, and that these

shreds of mucosa prolapsed into the drainage holes and united with one another, firmly fixing the button in its place. This peculiar behavior of the mucosa explains what I referred to above when I said that, though the tears apparently were only peritoneal, at autopsy other features showed that deeper tears, tears of the other layers of the intestine, were also produced.

From the foregoing remarks it will be apparent that the new button has the advantage of being easily and very rapidly introduced, without making a large incision in the bowel. That, on the other hand, it has the disadvantages that it divulses and tears the incision, that its halves must be driven home with great force, and that it frequently becomes firmly fixed in the anastomosis and is not eliminated.

A button to be of great use should have no such bad features, especially if it is to displace the methods of anastomosis by suture, or that by means of the Murphy button, as Gayet expects the new button to do.* I believe that Jaboulay's button will never displace these methods; in fact, never rival Murphy's button, much less the method by suture, in the general run of gastro-intestinal work.

In one class of cases, however, where its advantages are of importance and its disadvantages of little consequence, the new button may prove of great service. In advanced carcinoma cases, especially in very feeble cases of gastric cancer, the saving of time by the use of the Jaboulay button may be life prolonging, while the fact that it may not be passed is of little or no consequence. To emphasize its usefulness in this field in this type of cases, Gayet reports only 79 per cent. mortality in the last forty-one cases of gastro-enterostomy for carcinoma ventriculi. In cases where rapidity of operating is less essential, I cannot see any justification for using the new contrivance.

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* Gayet says, (op. cit., p. 10,) "Terrier, Hartman, etc., have declared themselves well satisfied with the suture method, which is readily understood, seeing that they have used the buttons of Murphy and of Villard."

EXPERIMENTS.

EXPERIMENT I.—March 22, 1905. Male dog, medium size. Posterior gastroduodenostomy and anterior gastrogastrostomy. Median two-inch incision in epigastrium, stomach and duodenum drawn into the wound. Smallest button (No. 1) employed for anastomosis. Incision into stomach and duodenum about one-third diameter of the button. Button easily introduced without tears and firmly driven home. Pressure or serosa near union requiring a suture. Anastomosis completed in two and a half minutes. Then an anterior gastrogastrostomy was done with button No. 2. The incision was about one-third the size of the button's largest diameter. Introduction of button tore the serosa, requiring several sutures. Button driven firmly home. Anastomosis in three minutes. Abdominal wall closed.

April 7. Button No. 1 passed.

April 12. Autopsy. Button in gastrogastrostomy union firmly held *in situ*. Both anastomoses very firm and satisfactory.

EXPERIMENT II.—March 24, 1905. Male dog, medium size. Posterior gastroduodenostomy and anterior gastrogastrostomy. Same technique as in Experiment I. Button No. 1 in posterior gastroduodenostomy. Introduction of the button tore the serosa on the duodenum, requiring a suture. Anastomosis, without rushing, in two minutes forty seconds. Button No. 2 in gastrogastrostomy; no peritoneal tears. Anastomosis in three minutes fifteen seconds.

Neither button was passed; autopsy about three weeks later showed excellent anastomosis. Button No. 1 was free in the stomach. Button No. 2 was almost free, though attached from one-third to one-half inch of its circumference by a tongue of mucosa that held it firmly, by becoming entangled in the drainage holes.

EXPERIMENT III.—March 29, 1905. Male dog, large. Posterior gastroduodenostomy and anterior gastrogastrostomy. Same technique. Jaboulay's button No. 3. Twenty-two millimetres button used in both anastomoses. Introduction of the four halves led three times to tears which required suture. Unions were tested for leakage by forcing bowel gas, etc., through the anastomoses and obstructing exit into bowel beyond. Apparently no leakage. During operation pancreas was injured and considerable hæmorrhage ensued.

Autopsy.—Dog died within twenty hours of operation. Abdomen contained considerable blood. Here and there flakes of fibrin, especially near the gastrogastrostomy anastomosis, where the button had separated. Examination of this button later showed that the two halves could be readily drawn apart by traction. The button was defective.*

EXPERIMENT IV.—April 12, 1905. Male dog; medium size. Posterior gastroduodenostomy and entero-anastomosis. Identical technique. But-

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* Jaboulay had similar experiences. The buttons can be readily tested before use by simply drawing on the two halves after they have been driven home. If the button separates, it is imperfect and not to be used.

ton size No. 2 used in posterior gastroduodenostomy; size No. 1 in the entero-anastomosis. Introduction of each half button very easily accomplished, but each and every time the serosa tore.

April 19. Button No. 1 passed.

A week or so later autopsy showed the other button *in situ*. There was no necrosis between the halves of the button. In addition, loops of mucous membrane ran through the drainage holes of the outer cylinder and firmly fixed the button.

EXPERIMENT V.—April, 1905. Male dog, medium size. Posterior gastrogastrostomy and duodeno-ileostomy. Button No. 2 used in the former, No. 1 in the latter operation. Technique similar to previous operations. Tear in stomach and tear in ileum. April 25. Button No. 1 passed.

May 10. Autopsy. Button No. 2 *in situ*. No necrosis of tissue between its halves. Mucous membrane prolapsed into drainage holes, firmly fixing button in its position.

EXPERIMENT VI.—April 26, 1905. Male dog, medium size. Posterior gastroduodenostomy and entero-anastomosis. Same technique. In both anastomoses button No. 1 used. Introduction causes two serosa tears.

May 2. Both buttons passed.

May 10. Autopsy showed excellent anastomosis.

EXPERIMENT VII.—Female dog, medium size. Posterior gastroduodenostomy and ileoduodenostomy. Same technique. Button No. 1 used in each anastomosis. Three tears produced by introduction of the three halves of the buttons. On driving the buttons home, the pressure exerted caused another serosa tear.

May 23. One button passed.

May 25. Second button passed.

Epicrisis.—In all, fourteen anastomoses were made. In no case was a reinforcing circular Lembert suture used. Perhaps such a suture might have prevented leakage in Experiment III. Jaboulay does not use a reinforcing suture, claiming it is unnecessary. If it is employed, the union is undoubtedly strengthened, and accidents, such as leakage, are prevented. Jaboulay lost two cases due to leakage. In introducing the halves of the button tears were made eighteen times. Of the fourteen buttons only eight cut their way out of the anastomosis. The eight buttons were all the smallest size button (No. 1). Why the larger buttons failed to cut their way out while the smallest size was regularly passed, I cannot understand, unless it be due to the fact that the larger the button the greater the tear in the coats of the intestine or stomach, and, as we have seen, these subserosal tears are very liable to fix the button firmly *in situ*.

TUBERCULAR PERITONITIS IN WOMAN.[1]

BY HENRY O. MARCY, M.D.,

OF BOSTON, MASS.

THIS comparatively rare disease is brought to the attention of the Congress since it offers an interesting field of observation, of profit for the prevention of tuberculosis, and each of the later years is adding cumulative evidence of cure by surgical intervention in a large percentage of the cases operated upon.

Inasmuch as the tubercular infection of the peritoneum has its invasion chiefly through the reproductive organs, it adds one more reason why the pelvic structures of woman should be maintained, as far as possible, in normal condition. A lacerated cervix, a chronic endometritis, a diseased Fallopian tube may make an easy admission for bacillary infection. Therefore restoration to normal conditions often serves the first purpose of preventive supervision.

The disease having been established, and diagnosis determined upon, the weight of evidence is strongly in favor of operative intervention, although the rationale is little understood. Excellent results have followed simple exploration even in advanced cases.

In 1885, I operated upon a young woman of twenty-seven years, unmarried, with a history of some months of suffering, anæmia, loss of flesh, slight abdominal distention from fluid, pelvic pain, preceded by irregular and painful menstruation.

The diagnosis of enlargement of the Fallopian tubes with fixation of the uterus and pelvic tenderness was easily made. Laparotomy was performed for the purpose of removing the appendages.

We were surprised to find a miliary tuberculosis thickly studding the abdominal peritoneum, the omentum and intes-

[1] Read before the American Antituberculosis League, April 18, 1905.

tines. Very considerable masses partially filled the pelvis. We sponged out the fluid and closed the abdominal cavity without drainage, giving a most unfavorable prognosis.

The convalescence was easy and rapid, and at the end of about four weeks she left the hospital in every way better than upon admission. The conditions at that time, from the surgical stand-point, were altogether new, and we watched her history with exceptional interest. She continued slowly and steadily to improve, and when last heard from, two years later, she wrote me, when on a visit to Europe, that she was in fair health, although there was not a complete restoration to her former vigor. Bacteriological examination confirmed the correctness of the diagnosis.

Somewhat later, in another woman, I opened the abdomen for the purpose of removing a large uterine myoma, and was equally surprised to find a widely disseminated miliary tuberculosis, so extensive that I abandoned the further operative interference, contenting myself with a careful sponging of the peritoneum with a strong solution of the bichloride of mercury. Here, also, the recovery was easy and rapid, and the patient has continued in fair general health with a marked lessening of the tumor. When last heard from, somewhat recently, her physician reported to me that she was in active discharge of her ordinary household duties.

The experiences of the years have added a very considerable number of somewhat similar cases. I find that little by little I have instituted a much more active intervention without being able to give an exact reason.

I sponge the peritoneal cavity very carefully for the removal of all fluids, and apply by sponging with care a solution of bichloride of mercury, 1-1000, to the entire peritoneum.

I use very freely afterwards normal salt solution, again drying the cavity carefully, blowing iodoform to disseminate it lightly but thoroughly over all the organs, and close without drainage.

I have occasionally varied the technique by filling the peritoneal cavity with hot normal salt solution and leaving it.

Thus far I have not had a single fatal result from operation. One patient died in about six months, evidently from a return of the disease. Perhaps two years is a minimum period in which to consider the cure complete, although the time limit must necessarily be a purely relative one.

A brief history of the last case within this limit is interesting.

Miss T., aged thirty-eight years. Always well except painful menstruation. Sudden invasion of abdominal pain occurred January 15, which was very severe. This was followed about a week later by a bloated feeling, and upon admission to hospital, February 22, 1903, the abdomen was distended more than twice its normal size. Diagnosis of probable tubercular peritonitis had been made.

Laparotomy performed; several pints of bloody serum removed. There was a thick exudate, partly filling the pelvic cavity, producing fixation of the reproductive organs. Minute tubercular nodules were widely disseminated upon the abdominal walls, omentum, and intestines.

The extent of the disease caused the making of an unfavorable prognosis. Convalescence, however, was uneventful and rapid, and at this date she appears to be thoroughly well.

It is generally accepted that the Bacillus tuberculosis enters the abdominal cavity, in woman, much more commonly through the Fallopian tube. This would not be expected when the tube is in a normal condition, as the ciliated epithelium deflects the passage of its contents towards the uterus.

For the same reason, the Bacillus tuberculosis rarely invades the pulmonary structures until the ciliated epithelium which line the bronchi are impaired in function or destroyed.

In the more recent period, peritoneal infections afford a subject for study of intense interest. It is invaded by the surgeon with a temerity hitherto undreamed of, and its maintenance in an aseptic condition is one of the most noteworthy victories of modern science. The peritoneal cavity may be considered as one enormous lymph sac.

When an infection occurs, one of nature's battles royal takes place. The abdomen provides an ideal culture chamber, heat point, albuminoids for food in abundance, conditions most favorable for development. It is interesting to note the extraordinary differences dependent upon the character of the implanted enemy. I have known a streptococcal infection prove fatal in sixty hours from its first invasion. In one instance, a supposed healthy woman felt something give away upon stepping into a high car. Death supervened in only a little over two days. The autopsy showed pints of flocculent fluid in the abdominal cavity. The infection arose from a cyst of the pelvis scarcely larger than a walnut; there was oozing from a small opening a dark, thick fluid. Cultures were made from both, demonstrating the identity of the infection.

The gonococcal infection of the Fallopian tube is a not seldom cause of a fatal peritonitis.

It is a matter of general knowledge that the Bacillus tuberculosis reproduces, in comparison with other forms of infection, exceedingly slowly.

This is why the "great white plague" has not swept the earth of the last inhabitant, and the knowledge of this slow reproduction gives most hopeful prospect for its prevention and cure.

If the rapidly multiplying hosts do not give opportunity for the obstruction of the lymph channels by nature's flying cohorts of leucocytes, the battle is soon over. In the slowly multiplying organisms of tuberculosis the picture is entirely different. The lymph channels are obstructed; the segregated colonies which have invaded them are surrounded by white cells imprisoned, and are often destroyed by their phagocytic action.

The fluid, usually a concomitant factor in advanced peritoneal tuberculosis, is in large measure a transudation from the capillary net-work of vessels, and in its escape lifts the endothelial cells lining the peritoneum. These cells, with leucocytes, float in the blood serum, and give to the fluid its flocculent character.

This albuminous fluid furnishes abundant bacterial food, and at the same time most seriously interferes with normal phagocytic action. In the removal of this fluid we find one important reason why surgical intervention is of value. Here the omentum, with its vast net-work of vessels, is a most important ally. Because of the anatomical construction, the power of absorption varies greatly in different parts of the peritoneal cavity.

In the diaphragmatic region, the lymph tracts and stomata are large; in the intestinal region of less size. In the pelvic region absorption takes place much more slowly.

It is rich in capillary lymphatics, but has few large lymph vessels. These small vessels are easily blocked by leucocytes, and a bacterial invasion is thereby more easily limited.

Such facts are of the first importance in aiding us in inferential deductions as to the benefit derived from operative interference. First, the removal of the fluid; second, the stimulating effect of exposure of the peritoneal surfaces to the air, the mechanic irritation of sponging, the chemic effect of medicamenta, *e.g.*, mercuric solutions, iodoform, etc. All such measures greatly increase the leucocytes, upon which it is very probable the destruction of the bacteria and the resultant cure depends.

Arangeli (Thesis Breslau) advanced the theory that the serous exudation following operation possesses powerful immunizing qualities of curative value arising from dead bacteria. He claimed to show advantageous results from the injection of ascitic and pleural effusions. The inference was easily drawn from the advantageous use of antidiptheritic and other serums.

Ebstein (*Boston Medical and Surgical Journal*, December 13, 1900) collected the histories of 227 cases of tubercular peritonitis where operation was performed. His conclusions are that the simple opening of the peritoneum is the one factor of value. He reports 15 cases from the Breslau Clinic of apparent cure.

Bottomly (*American Medicine*, January 31, 1903), of Boston, reports and analyzes 28 cases operated on. He concludes that cures may reasonably be expected in 30 per cent. to 40 per cent. of all cases.

A. E. Halstead writes very carefully upon tubercular peritonitis, dividing it, from a clinical stand-point, into two heads, cases in which ascites is predominant and those in which tumor formation is the marked feature.

Diagnosis usually difficult. History of antecedent disease important. The patient should not be considered cured until five years have lapsed after operation.

He states over 1500 cases treated by laparotomy have been recorded. In the ascitic form of the disease, the operative treatment can be conservatively stated as giving 40 per cent. to 50 per cent. of definite cures.

The surgeon has by his intervention made a most valuable contribution towards the prevention, limitation, and cure of one phase of the most wide-spread and deadliest enemy of mankind.

Dr. Wyeth's case of fracture at the base of the first phalanx of the ring-finger.

FRACTURE OF A PHALANX NEAR THE EPIPHYSIS.

BY JOHN ALLAN WYETH, M.D.,

OF NEW YORK

Professor of Surgery in the New York Polyclinic.

A GIRL twelve years old presented herself at my surgical clinic at the New York Polyclinic Medical School and Hospital with a history of having fallen six weeks before and hurt her left hand.

The radiograph made by Dr. Milton Franklin shows the deformity due to a very unique fracture of the first phalanx of the ring-finger. It will be observed that there was no separation at the epiphysis, the fracture occurring beyond this point, leaving a thin film of bone on the epiphyseal side. There was marked displacement of the phalanx towards the middle finger with union in this false position.

Three days later the girl was anæsthetized, and an incision made over the point of fracture on the side of the finger nearest the middle finger. A refracture was made, some intervening soft tissues dissected out, and the phalanx carried into its normal position, with subsequent union without deformity.

AS TO THE NECESSITY OF CONSENT TO RENDER SURGICAL OPERATIONS LAWFUL.

BY JOHN FRANKLIN SHIELDS, ESQ.,

OF PHILADELPHIA.

THE purpose of this discussion is to state the law as it appears to be; but we also wish it to be understood that to relieve the surgeon of annoyance, litigation, and expense, full and clear consent should be had in all cases whenever possible.

Only four decisions directly on the subject of this opinion have, up to the present time, been rendered by Courts of the last resort within English or American jurisdiction.

They are: McClallen *vs.* Adams, 19 Pickering (Mass.), 333. State *vs.* Housekeeper, 70 Maryland, 162. Pratt *vs.* Davis, Appellate Court of Illinois, February, 1905. Beatty *vs.* Collingworth (an English case), Central Law Journal, vol. xliv, page 153.

Herein we will simply refer to these cases without quoting the reports.

The operation in each of the cases above referred to, while believed advisable by the surgeon in each instance, does not appear to have been performed in cases demanding immediate operation as the only chance to save life. The opinion rendered in Pratt *vs.* Davis is the most recent and by far the most exhaustive opinion of the four, and recognizes the other three cases as authorities.

It will be of material aid in securing a clear analysis of this subject to divide the requirements for a surgical operation into two classes.

FIRST: THOSE WHERE A SURGICAL OPERATION IS ADVISABLE, BUT AN IMMEDIATE OPERATION IS NOT IMPERATIVE TO SAVE OR PROLONG LIFE.

SECOND: THOSE WHERE AN IMMEDIATE OPERATION IS NECESSARY AS THE ONLY COURSE OF TREATMENT KNOWN WHICH MAY SAVE OR PROLONG THE PATIENT'S LIFE.

Consent may be express or implied. That consent will be implied where one places himself in the hands of a physician or surgeon and submits to an operation is the law set forth in all the cases above mentioned.

A. AS TO THE CONSENT OF AN ADULT.

In the cases where operations are advisable but an immediate operation is not imperative to save or prolong life, the consent of the patient is required, and is sufficient to make the operation lawful, and the operator is not liable for any error of judgment, provided he has exercised that care and skill which the law requires. Pratt *vs.* Davis, Supra; State *vs.* Housekeeper, Supra; McClallen *vs.* Adams, Supra; State *vs.* Gile, 8 Wash., 12; Comm. *vs.* Pierce, 138 Mass., 165.

"Under a free government at least the free citizen's first and greatest right, which underlies all others,—the right to the inviolability of his person, in other words, the right to himself,—is the subject of universal acquiescence, and this right necessarily forbids a surgeon or physician, however skilful or eminent, who has been asked to examine, diagnose, advise, and prescribe, to violate without permission the bodily integrity of his patient, by a major or capital operation, placing him under an anæsthetic for that purpose and operating on him without his consent." Pratt *vs.* Davis, Supra.

The Court in stating the above had the facts of the particular case in mind which was before the Court, as elsewhere in the same opinion the Court said:

"Perhaps, too, the various cases which might be supposed of sudden and critical emergency in which the surgeon would be held justified in a major or capital operation, without express consent of the patient, might be referred to the principle of implied license." Pratt *vs.* Davis, Supra.

If the patient be a wife, her consent to the operation is all that is necessary (provided the wife be compos mentis). It is prudent to notify the husband, but it is not necessary. Even if he refuses consent, the consent of the wife is sufficient. McClallen *vs.* Adams, Supra; State *vs.* Housekeeper, Supra.

If the patient is non compos mentis, hence incapable of consenting, it would appear that the consent of the person (or persons) in control over the person of the lunatic is necessary. There must be no doubt of the patient being incapable of consent. The surgeon's opinion is not sufficient. A judicial inquiry, first determining the patient's insanity, would relieve the surgeon of liability of operating without consent if the patient afterwards brought action against him. Pratt *vs.* Davis, Supra. The surgeon should also satisfy himself as to parties legally in control of the person. Pratt *vs.* Davis, Supra. In the case of an insane wife, the consent of the husband might not be sufficient, for the same reason that a husband cannot restrain the liberty of his wife on the ground of insanity, without having an inquiry judicially made and her insanity legally declared. Pratt *vs.* Davis, Supra.

In the second class of operations, to wit, *where an immediate operation is imperative as the only chance to save or prolong the patient's life, and hence that death would certainly and positively result without the operation,* the consent of the patient, when an adult, would of course be sufficient, as in the first class of operations, to make it lawful.

"And even if the disease resulting in the patient's death is caused by the operation, the surgeon is not liable if he performed the operation with the patient's consent, and under the belief that the operation was proper to be performed." State *vs.* Housekeeper, Supra.

However, in such positive life and death cases, the question naturally arises, Would an operation be lawful against the will of the patient? It is quite unlikely that such a case will ever arise, as it would be a rare case indeed where a surgeon would operate at such a time. The danger and risk to a surgeon of an action at law under such a set of facts, is the difficulty which would likely arise in getting the evidence and facts so that the jury, and also the Court, would be convinced that the operation was the only course of treatment to be pursued, that the said operation did not cause the death or did cause the recovery of the patient. The plaintiff gen-

erally can secure some other physician who honestly, or dishonestly, will be found to disagree with the surgeon's diagnosis, prognosis, or mode of treatment.

Further, it would appear that *a surgeon operating against the will of a patient would be liable for any error of judgment, regardless of his due care and skill.*

But granted that the surgeon did operate against the will of the patient, when the operation was the only chance to save or prolong the patient's life and the operation did not cause the patient's death, it would appear under the law that the surgeon would not be liable, for the reason that society has a higher right to the individual's life than the individual has himself (an individual not having the right to dispose of his own life). Under the facts just stated, if the patient recovers by reason of the operation, clearly he has no action, as what was done by the surgeon was done for the benefit of the person and there is no harm done, and hence no element of damage upon which to base a recovery, even though there is a technical trespass. If the patient dies, that which was done for him was just as much for his benefit, and his death was not caused by the operation nor was life shortened, and hence there is again no element of damages upon which to base recovery.

Further, under such a set of facts, it would be impossible for the operation to be the proximate cause of death. For this reason there could be no recovery in law.

"If a physician be guilty of malpractice, but the operation, no matter how gross malpractice, was not the proximate cause of death, there can be no recovery." Braunberger *vs.* Cleis, N. S. iv, 587, American Law Register.

If the death of a patient upon whom a surgeon has performed an operation results from disease, and not from the operation, the surgeon is not liable for such death. State *vs.* Housekeeper, Supra; Wohlert *vs.* Seibert, 23 Sup. ct. (Pa.). 213.

AS TO OTHER OPERATIONS DONE OF NECESSITY.

"*A class of exceptions as to which there is not much authority, but which certainly exists in every system of law,*

is that of acts done of necessity to avoid a greater harm, and on that ground justified. Pulling down houses to stop a fire, and casting goods overboard, or otherwise sacrificing property, to save a ship or the lives of those on board, are the regular examples. The maritime law of general average assumes, as its very foundation, that the destruction of property under such conditions of danger is justifiable. In these cases the apparent wrong 'sounds for the public good.' There are also circumstances in which a man's property or person may have to be dealt with promptly for his own obvious good, but his consent, or the consent of any one having lawful authority over him, cannot be obtained in time. Here it is evidently justifiable to do, in a proper and reasonable manner, what needs to be done. It has never been supposed to be even technically a trespass if I throw water on my neighbor's goods to save them from fire, or, seeing his house on fire, enter on his land to help in putting it out. NOR IS IT AN ASSAULT FOR THE FIRST PASSER-BY TO PICK UP A MAN RENDERED INSENSIBLE BY AN ACCIDENT, OR FOR A COMPETENT SURGEON, IF HE PERCEIVES THAT AN OPERATION OUGHT FORTHWITH TO BE PERFORMED TO SAVE THE MAN'S LIFE, TO PERFORM IT WITHOUT WAITING FOR HIM TO RECOVER CONSCIOUSNESS AND GIVE HIS CONSENT. These works of charity and necessity must be lawful as well as right." Webb's Pollock on Torts, American Edition, pages 199 and 200.

See also, affirming above, Wharton's Criminal Law, Section 146:

" Perhaps, too, the various cases which might be supposed of sudden and critical emergency in which the surgeon would be held justified in a major or capital operation without express consent, of the patient might be referred to the principles of implied license." Pratt *vs.* Davis, Supra.

B. AS TO THE CONSENT OF A PARENT PREVIOUS TO AN OPERATION UPON MINOR CHILDREN.

In any discussion as to the necessity of consent of a parent to surgical operations upon minor children (since no

cases on this subject have ever come up for decision within English jurisprudence), we must look to the basic principles of law governing the matter, for the authority of our statements. Further, the question arises, when does the child arrive at such an age that its discretion is presumptively sufficiently developed that it may have the right to decide as to its need of an operation, without the parent's consent, and against the parent's consent? This would appear to be at fourteen years of age, as will be set forth further on in our opinion.

Under the law in general, when a presumption would arise that the child had or had not arrived at the age of discretion in such matters, that presumption either way would be open to rebuttal on evidence shown, as to the mental capabilities of the child.

Under the Roman Law the father had absolute control of the life of his child. But this was never true under English Law. The duties of the father to the child are those necessary for its maintenance, protection, and education. THE POWERS OF THE FATHER OVER THE CHILD ARE FOR THE PURPOSE ONLY TO ENABLE HIM TO PERFORM HIS DUTIES TOWARDS THAT CHILD AS TO MAINTENANCE, PROTECTION, AND EDUCATION, AND ENABLE HIM TO RECEIVE IN RETURN THE BENEFIT OF THE SOCIETY AND SERVICE OF THAT CHILD. Schouler on Domestic Relations, page 383; 1 Blackstone's Commentaries, page 452; 2 Kent's Commentaries, 203.

Under the Common Law the father had no other powers over the child, except as was necessary to obtain these objects, and no other powers have been conferred on him, except to better enable him to perform his duties, and to entitle him to the full benefits of the society and service of the child.

During the more tender years of an infant's life, a child is not amenable to the laws for its acts, not having sufficient discretion to know right from wrong. According to Blackstone, the age of discretion is twelve years. A child of twelve or fourteen years of age can give a valid consent to marriage. Ward's Estate, 30 Pittsburg L. J., 394. Beelman *vs.* Roush, 26 Pa. 509. State *vs.* Lowell, 78 Minn. 166.

A father has no right to control the rights of his minor child, who has arrived at the age of discretion, in relation to public worship. Commonwealth *vs.* Sigman, 2 Clark, 36. Commonwealth *vs.* Edmunds, 2 Legal Gazette, 98.

A presumption arises at law as to a child's capacity to be guilty of contributory negligence if the child be over fourteen years of age, and hence that they have such discretion as to be sensible of danger. Kehler *vs.* Schwenk, 144 Pa., 348.

In Habeas Corpus proceedings for the custody of children over the age of discretion, the Courts of Pennsylvania take into consideration the wishes of the child. In re Fitzpatrick, 9 Kulp, 309.

In the matter of selection of guardians, Courts of Pennsylvania must consult minors over fourteen years of age.

A child of seven years has been held guilty of trespass in this State.

"After the age of fourteen, the presumption is that the infant has criminal capacity." May's Criminal Law, page 27, and cases thereunder.

"On the attainment of fourteen years of age the criminal actions of infants are subject to the same mode of construction as those of the rest of society." Russell on Crime, chapter ii. page 7.

"Force to the person is rendered lawful by consent in such matters as surgical operations. In the case of a person *under the age of discretion*, the consent of that person's parent or guardian is *generally* necessary and sufficient." Webb's Pollock on Torts, pages 186 and 187. See also "Law and its Relation to Physicians." Taylor, page 315.

It will be noted in the above quotation that it does not say, in the case of a minor, or a person under legal age, but expressly states "under the age of discretion."

The age of discretion would be the age at which a child can comprehend the danger of its condition and the danger of an operation when sufficiently informed by a skilled physician or surgeon. In other words, when the child is mentally capable to give consent to a surgical operation.

Surely no higher degree of mental capabilities would be necessary to raise the presumption of capability to consent to surgical operations than those required to raise the presumption of a child's capacity to be guilty of contributory negligence, or to be held presumptively liable for the most serious crimes.

That a child above twelve or fourteen may consummate a valid marriage even against the consent of the parent certainly does support the opinion that a child at the age of fourteen has presumptively the capacity to consent to a surgical operation. Even the crime of rape, recognized as one of the most hideous at Common Law, was never possible if the girl was fourteen and consented to the act. (To make the age of consent otherwise has required the enactment of a statute.)

Hence the age of discretion when presumptively a minor is capable of consenting to a surgical operation without or against the parent's wish would be over fourteen years.

Further, the parent of a child is under duty to see that his offspring does not suffer from the necessities of life, and this includes medical necessities, and conscientious or superstitious opinions of parents that it is wrong to have medical aid is no excuse. See Wharton and Stillé, Medical Jurisprudence, third volume of fifth edition, page 441, and cases thereunder mentioned.

So that it would appear to be the law that in the first class of cases of operations, to wit, where an operation is advisable, but not imperative to be done immediately for saving or prolonging the life of the child, if the child is under the age of discretion, consent of the parent is necessary; the child being incapable to decide as to the skill of an operator, to choose the time of the operation, etc.

But this does not mean that the parent has a right to deny the child the benefit of an operation, when this is clearly and positively the only course of treatment known.

In fact, the father is bound to have the operation performed on the child if the child's condition demands it, as a

matter of medical necessity. In other words, it must be clearly held in mind that the father has not the right over the health and life of the child to the child's positive detriment. The law will hold him to account if he refuses such benefit.

WHERE THE CHILD IS OVER THE AGE OF DISCRETION (while, if possible, it is prudent to have the parent's consent, because no surgeon wishes to be involved in litigation), yet if it is such a clear and positive case that the only course of treatment is that of an operation, it would appear sufficient to have the child's consent to perform the operation, for the reason that the child has a higher right to its own health and life than the father's right over the child's person. Further there can be no element of damages where the operation is to the benefit of the child, the benefit conferred being greater than any harm done.

Probably, as no decision has been rendered as to the law under these facts, the Court would incline, if the operation be proven of no benefit or that the benefit was not greater than the harm, to allow the parent to recover for the loss of service of the child, even if the child be over the age of discretion. However, as the husband's rights to the wife are the society and service of the wife and those of the parent to the child are the same, the identical reasons which the Court has given for ruling that the wife's consent only is necessary, would appear to apply with equal force as to the consent of a child above the age of discretion, being the only consent necessary and the parent's consent unnecessary. And as the husband cannot recover under the facts for the wife's services, for the same reasons the parent cannot recover for the services of the child.

AS TO THE CONSENT OF THE PARENTS IN AN OPERATION UPON A CHILD WITHIN THE SECOND CLASS OF OPERATIONS, to wit, those where an immediate operation is necessary as the only course of treatment which may save or prolong the child's life (while it would be prudent here, as in all cases to avoid litigation, to have the parent's consent), if the child be of the age of discretion and consents, the consent of the parent does not appear necessary.

If the child be of tender years, the surgeon would probably be liable only for any error of judgment, if he operated against the parent's will. The risks of litigation and liability, however, would be almost identical to those referred to in our discussion of operations, in "life and death cases" upon adults against their will.

In serious illness, the father is held by the law under stern duty to provide skilled medical attention whenever possible to do so. It would appear from the very fact that the duty falls upon him to procure a physician, that it is not within the father's judgment to decide what shall be the course of treatment, unless there be a choice known to him, for the very reason that the law demands that he call in a skilled physician in serious illness to give the child the benefit of medical knowledge, of which the father is ignorant.

Where it appears under the evidence that the physician did that which was the only possible thing to be done in order to give the child its chance of life, the very law which requires the father to provide skilled medical attention would require him to allow that this be done. The parent's right to prohibition under such conditions would mean, and mean nothing else, but that the father had a right even to the life of the child, which is an absurd contention in English jurisprudence.

The child has a higher right as to its own life than the father's right as to the person of the child. Society has a still higher right as to the life of an individual member; and hence, where under all the evidence it would appear that the surgeon did, *in a time of life or death, that which was the only course of treatment to be pursued, even if he did it under such circumstances that it was clearly against the wishes of the parent, the surgeon would not appear to be liable.*

The surviving action to parents on the death of a child is for loss of pecuniary services. If the operation does not cause death, no loss of service can be shown as the result of the surgeon's act, and hence the surgeon has no liability. But to protect himself from any error of judgment it would appear the surgeon should have, as a rightful precaution, the

parent's consent, at least where the child is under the age of discretion.

The statements made in our discussion as to operations of the second class upon adults and *against their will*, would govern as to operating, in the same class of cases upon minors, over the age of discretion against their will, or upon children, *under* the age of discretion, against the will of the parent.

It is as old as the Common Law that if a man be drowning and one goes to his aid, and in saving him, does necessarily and incidentally violence to his person, the one thus aiding is not liable, whether he succeeds in his efforts or not. What he did was for the benefit of the other and for society, and that which the law commends to be done rather than not to be done.

AS TO OTHER OPERATIONS DONE OF NECESSITY, such as where a child is found unconscious, and a competent surgeon perceives that an operation ought forthwith to be performed at once, it is lawful for him to do so, the same as in the case of adults previously discussed and for the same reasons.

The use of the term "surgeon" herein of course includes only those who are qualified according to law, to hold themselves out as such to the public.

Also it is to be understood that the diagnosis, prognosis, and operation have been made with that ordinary due care and skill, taking into consideration the advanced knowledge of the times, which is required of all physicians and surgeons by law.

SUMMARY.

Consent of an *adult patient* in good mental health is sufficient to relieve the surgeon of liability in all classes of cases.

Lunatic Patients.—The surgeon should have the person legally declared a lunatic, if time permits, and have the consent of those legally in charge of the lunatic. If the urgency of the case does not permit such delay, the consent of those directly in control of the lunatic and the "consent" of the lunatic, if possible, should be secured.

In all cases of sudden and critical emergency the law will imply consent or justify the surgeon's act by implied license. This is true as to all individuals, adults or minors.

Minor Children.—Consent of parent and child if possible should be had to protect the surgeon against *litigation.* Under the age of fourteen years the parent's consent is especially necessary to protect the surgeon against litigation and error of judgment. Over the age of fourteen years the consent of the child, in serious cases, would appear sufficient.

Since writing the above opinion, a case has been handed down by the Supreme Court of Minnesota which the Author considers supports the above opinion. The case is Mohr *vs.* Williams, 104 N. W. Reporter, page 12.

J. F. S.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, June 5, 1905.

The President, HENRY R. WHARTON, M.D., in the Chair.

SILVER PLATE AND SCREW FIXATION IN FRACTURES OF THE TIBIA.

DR. JOHN H. JOPSON showed a boy in whom he had treated a compound fracture of the tibia by primary fixation of the fragments by means of Halsted's silver splint and screws. The wound had healed with the splint *in situ*, and the result was a perfect one as far as the fracture was concerned. There were certain advantages of the splint and screws over silver wire in the primary fixation of recent fractures which Dr. Jopson thought were sometimes overlooked. In the present case, operation was demanded in the first place because of the difficulty of reduction of an oblique fracture of the tibia complicated by a small wound. The broken ends had rotated in opposite directions. After incision, reduction was satisfactorily accomplished. To have now drilled and wired the fragments would have required much more manipulation and traumatism than the use of the splint and screws, which were easily applied without disturbing the relations of the bone in the wound, and which held the fragments firmly in apposition. Union took place as rapidly as in a simple fracture. Steel screws were used, as silver ones were not at hand. Nearly three months have elapsed since operation, and, while the wound is still solid, there is a little tenderness and swelling of recent development at the site of the splint, which probably means that it will require removal.

DR. JOHN B. ROBERTS said that this method had been for years a favorite with Dr. L. W. Steinbach, with whom he was

associated at the Polyclinic Hospital. The expedient was uniformly successful in holding together the fragments, but he thought that lately Dr. Steinbach is not so enthusiastic regarding its use. He finds that some of the cases are followed by suppuration, due largely to the necessary laceration of the soft parts in applying the splint. This sequel is more apt to occur in deep fractures than in those of superficial bones such as the tibia, the wounding of muscles and other soft tissues being much more extensive in the former. Notwithstanding, Dr. Steinbach secures good results. Dr. Roberts has never employed the splint, but once removed one which had been inserted by another surgeon. The fracture originally was a bad one, and suppuration followed. In treating a recent fracture similar to that reported by Dr. Jopson, Dr. Roberts exposed the fragments and put in two steel staples of his own design, which in some ways are preferable to other devices for holding the fragments in apposition. To insert a wire, the ends of the bone must be freed and drilled, which of necessity cuts and irritates the tissues; in addition, the ends of the bone will wobble when the wires are inserted. Dr. Roberts used a staple which possesses two projecting points, which are driven into holes drilled for them in the fragments. This is simpler than inserting screws and gives greater rigidity than is attainable with wire. Dr Roberts has also employed fracture-nails with ends fashioned as drills. These are inserted into the bones and make the apposition of the fragments a rigid connection. They are afterwards pulled out. They possess one advantage in that they may be used in subcutaneous fractures.

Dr. Richard H. Harte said that he had used the Halsted splint a number of times, but does not now employ it so often as formerly. Regarding this appliance, an important point to remember is the necessity of using a long splint. Too many surgeons employ a short splint which furnishes support only at the extreme ends of the fragments. It is best to insert four screws, two in each fragment. If a short splint and two screws only are employed, the support given thereby is very slight, and the method possesses no advantage over wiring. Dr. Harte's experience is that removal of the splint is required in essentially every case; removal, however, is a very simple process. As to the use of iron screws by Dr. Jopson, he believes such screws are better than the silver ones as ordinarily sold. The latter are imper-

fectly made, the threads being much inferior to those on the iron wood-screws, which he would not hesitate to use in a similar case.

Dr. Jopson, in closing, said the staple described by Dr. Roberts appealed to him as being a good appliance, but the Halsted splint has superior advantages. The latter may be cut in desired lengths for any case. In the one reported, the fracture was oblique, and the fragments were held very firmly by two screws above and one below the line of separation. He was quite surprised when the sinus which had formed at the site of a gauze drain underwent spontaneous closure. It will be a simple matter to remove the splint if necessary, and will cause no damage, as the purpose for which the splint was inserted has now been long accomplished.

LAMINECTOMY FOR FRACTURE OF VERTEBRA.

Dr. James K. Young presented a woman who fell eight years ago, fracturing the spine in the dorsolumbar region. In the course of her treatment, a laminectomy was performed by Dr. Ashhurst at the University Hospital. After three months patient was discharged. She was not able to move below the waist. Sensation was absent.

One year after her fall, she went to the Orthopædic Hospital, where she was under the care of Dr. S. Weir Mitchell. She was treated with massage, static electricity, and rest. Improved gradually, until in the course of two months she could walk in a wheeling-crutch. After two months more on crutches she began to walk with a cane.

On October 8, 1904, she came under the observation of Dr. Young, who found that she could then walk on a level, but was unable to walk up and down stairs. Was unable to stand alone. Right leg has lack of co-ordination. Massage, electricity, and special movements were directed to be given to encourage co-ordination. The posterior group of muscles in the thigh and calf are the ones most affected. There is some deviation of the spine. Spinal support applied.

June 1, 1905, Dr. Young finds that she is able to walk up and down stairs with the use of a cane. Is not able to stand unless she can touch something, must move if she cannot hold to something. Legs are much stronger. The right leg is slightly

numb. Ever since the injury, she has had a burning sensation in the right leg in the region of the sciatic nerve. This sensation begins in the heel and goes up the back of the leg. It is not continuous, but comes and goes. She experiences it every day. There is pain in the back, in the lumbar region, sometimes severe, and usually accompanied by headache.

Recently she has not had as good vision in the left eye as in the right, especially when she is fatigued. Tested the vision at thirteen inches, and found the right eye much better than the left. She sleeps well, has a good appetite, and the general health is good. She jumped several inches from the floor to-day. In her own home she frequently walks without support.

Dr. Young said that his object in presenting this case was to direct attention to the importance of the after-treatment of fractures of the spine, particularly by the use of spinal supports, massage, electricity, and of every known means which will restore function to the muscles. He had frequently been asked to examine cases of fracture of the spine, one or two years after a laminectomy, where a marked kyphosis was present and where efficient support had not been used.

PARALYSIS OF ARM FROM DISLOCATION OF SHOULDER AT BIRTH.

Dr. James K. Young presented an infant, aged nine months, whose left shoulder was dislocated during birth by traction, resulting in paralysis. Electrical treatment was given. The case had been diagnosed as birth palsy.

Examination, March 19, 1904, showed a backward dislocation of the humerus, with limitation of motion, deformity, and pain upon movement. The arm was held rigidly at the side in a position of marked pronation. Skiagraph showed backward and downward dislocation of the humerus.

He reduced the dislocation April 7, 1904, under anæsthesia. Two months later there was some limitation at the elbow-joint, and some rotation of the radius. This he broke up by forcible manipulation, under anæsthesia. Electricity, massage, and exercises were given, which was followed by marked improvement, continuing up to the present time.

His object in showing this case was to direct the attention

to the frequency with which dislocation of the shoulder is mistaken for birth palsy. Injury to the brachial plexus may result from injuries during birth, but dislocations of the shoulder, if allowed to continue, will produce pressure palsies resembling birth palsies, as in the case exhibited.

SPIRAL FRACTURE OF THE HUMERUS CAUSED BY JIU-JITSU.

Dr. George Morris Dorrance presented a boy, aged fourteen years, who came under his care at St. Agnes's Hospital on March 30, 1905, with the history that while practising jiu-jitsu with a playmate he had fractured his humerus. The hold gotten by his opponent consisted in catching him by the left wrist with the forearm flexed on the arm, and rotating the forearm outward.

When seen by Dr. Dorrance the deformity consisted of an outward and upward displacement of the upper end of the lower fragment with one and three-fourths inch shortening; this was overcome by putting the arm on an anterior angular splint with four pounds hanging from arm. At present he has one-half inch of shortening, with full power and use of arm. Massage and passive movements were started on the seventh day, and continued for five weeks.

Dr. Richard H. Harte said the skiagraphs shown by Dr. Dorrance illustrated what he had seen in a fracture caused by a similar accident. Two men engaged in a friendly trial of strength attempted to throw each other's arm to the side, and the humerus of one was fractured. Some time afterwards the man died from other causes, and the specimen showed the same kind of fracture as that just reported. The line of separation was spiral in shape, as though the bone had been twisted off.

OPERATIONS PERFORMED AT THE GERMAN HOSPITAL.

Dr. John B. Deaver presented a report giving an analysis of the operations performed at the public clinics for students held at the German Hospital during the session of 1904–05.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, May 1, 1905.

The President, L. L. McArthur, M.D., in the Chair.

GENERALIZED SYSTEMIC BLASTOMYCOSIS.

Drs. D. N. Eisendrath and Oliver Ormsby reported the following case:

The patient was a Polish laborer, aged thirty-three years, married, and had two healthy children. Had been ill since February, 1904. Was admitted to the Cook County Hospital in February, 1905, and assigned to the service of Dr. Eisendrath.

His present trouble began in February, 1904, the first noticeable departure from his usual good health consisting in a feeling of discomfort, involving the chest on the right side and extending clear through from front to back. This lasted for some time, and, in fact, is still present, being better and worse at intervals. In June, four months later, his first cutaneous lesion appeared. This was located below the left ankle and extended down to the heel, and eventually became a little larger than a dollar. Shortly afterwards the balance of the lesions appeared, but it is impossible to tell their exact mode of development. In addition to this area, the right leg had several large lesions, also the right and left forearm, and the face, chin, and neck, especially on the right side. Most of these lesions were quite superficial, the larger part of each being an ulcer, crust-covered in places, open in others. There was little induration but considerable sanguinopurulent discharge. The edge of the ulcer was slightly elevated and presented a bluish-red halo, in which there were located a few miliary abscesses. In some places of the area a papillomatous condition was present. The lesion on the arm was a subcutaneous nodule,

which later softened and was incised, and from the sinus left after this procedure, and in pus from both the lesions on the legs, the organism of blastomycosis was demonstrated. There was also present a large swelling on the left forearm, which apparently involved the whole circumference. It began about two and one-half inches below the elbow-joint and extended down the forearm about four inches. It involved both sides of the arm, and suggested the possibility of bone involvement. In a skiagraph of this lesion the bone appeared normal. This swelling was later incised and the same characteristic discharge released. There is still (May 1) marked involvement in this area. The lesions on the face protruded more extensively above the level of the skin and were papillomatous, and some were even verrucous. There was much discharge and marked crusting

About November, 1904, great muscular weakness set in and marked swelling of the feet and ankles occurred. This gradually increased until he was unable to work. On his admission to the hospital, in February, 1905, he presented lesions on all the above-mentioned areas, and was very much emaciated, pale, anæmic, exceedingly weak, and had some elevation of temperature. Marked œdema was present in the ankles, feet, face, and arms. He coughed only occasionally. Although the patient constantly denied having a cough or expectoration of any moment, and although his attendants at the hospital had not noticed these symptoms, on April 26 a large amount of blood-stained muco-purulent sputum was collected, in which the organism was plentifully found. On March 22, pus was removed from a subcutaneous, unruptured abscess situated on the left forearm and inoculated on various media, and later in animals. Pure cultures of blastomycetes grew on all the cultures. On March 28, six days after this inoculation, growth was plainly visible, and after this the cultures grew rapidly. These were pure cultures of blastomycetes. While, as is usual, only spherical and budding forms appeared in the fresh pus, segmented mycelium, with lateral conidia, grew on the media. This pus was stained for tubercle bacilli, with negative results. Blood cultures, thus far, have been negative, as has also examination of the urine relative to blastomycetes. Albumen and casts were present, however, in the urine. On March 23, tuberculin was given with negative results. No tubercle bacilli have as yet been demonstrated in

sections or pus. This examination is far from complete. During his two months' sojourn at the hospital, his temperature has ranged from 98.6° to 102.8° F. The latter half of the time the temperature has been considerably lower. As a rule, there is an exacerbation each evening. Under large doses of potassium iodide internally, with radiotherapy, antiseptic dressings, and surgical interference locally, marked improvement has occurred. The cutaneous lesions have largely healed and the patient has gained in weight, but he still has much infection internally, as evidenced by the numerous organisms demonstrated in the sputum only five days since, and also by other general symptoms.

Animal inoculations are under way, but no report can be made as yet.

DR. FRANK HUGH MONTGOMERY called attention to the increasing number of systemic cases of blastomycosis. In addition to the four published cases referred to by Dr. Ormsby, the one reported by Curtis, in France, was undoubtedly of the same nature, and the five or six cases reported from California as "Protozoic Disease" or "Coccidoidal Infection" were almost identical with systemic blastomycosis in clinical symptoms, including fatal termination, and in the organisms cultivated. The organisms in the California cases, however, differed from those found in blastomycosis in that in tissue they developed by endogenous spore-formation and never by budding. This distinction called for a separate classification of these cases at present. Though it was known that some varieties of blastomycetes, under certain conditions, might multiply by endogenous spore-formation, in all the cases of blastomycosis so far studied the organisms in the tissue developed by budding. Although frequently in cultures and a few times in tissue the speaker had seen blastomycetes which contained what appeared to be spores, he had never been able to trace the further development of these spores either in tissue or in cultures.

In addition to the reported cases, there were now in the neighborhood of Chicago at least five individuals under observation suffering from a systemic infection with blastomycetes, and several other cases in which systemic infection is probably present. In view of the number of generalized cases now recognized, the subject of blastomycosis was becoming one of general medical and surgical interest, and could no longer be limited to the field of dermatology.

DIFFUSE MULTIPLE FIBROMA MOLLUSCUM.

DR. DANIEL N. EISENDRATH presented a man, sixty-five years of age, who stated that he noticed the development of these tumors about forty years ago. The chief reason for showing the patient was more as a medical curiosity than from a therapeutic stand-point. The man presented himself at his clinic at the College of Physicians and Surgeons about three weeks ago. Microscopically, these numerous tumors were composed of soft fibromatous tissue. Some of the tumors were considerably larger than others. Those on the breast were quite large. Some of the tumors felt much harder than others, and as though they contained cartilage. He exhibited photographs of a similar case seen at the County Hospital.

Whether this disease had something to do with the nervous system was still an unsolved question. Sometimes the disease was symmetrical, at other time it was not. It appeared in various places on the face in some, while in others there were no tumors on the face. In the present case the man had an unusually large number, chiefly confined to the anterior and posterior surfaces of the trunk.

SCHEDE'S OPERATION FOR EMPYEMA.

DR. D. A. K. STEELE showed a young man, German-American, twenty-eight years of age, who was taken sick a year ago last February with pulmonary trouble. He saw him in the latter part of January or the early part of February of this year, about a year after his illness began, and at that time he was suffering from a chronic empyema of the left chest. He had been under the care of a competent physician for a considerable length of time, had been treated by him, and the chest had been aspirated repeatedly. Subsequently a drainage-tube was introduced between the ribs. There was a great deal of emaciation; the patient was cachectic, and drainage at the time he saw the patient was inefficient, the drainage opening being filled up with granulation. Patient went to Wesley Hospital, where a couple of inches of rib were resected, and a double drainage-tube introduced, the cavity flushed, and treated in the ordinary way for a few weeks.

Patient returned home, and the irrigation of the empyema cavity was continued after he returned home. Two or three weeks ago, as the patient was not doing very well, he advised the resection of all the ribs from the second rib down on the left side, a typical Schede operation for the purpose of obliterating the empyema cavity. Patient again entered the hospital on the 30th of March, and was anæsthetized, the first operation having been done under cocaine anæsthesia, the second under general anæsthesia. The ordinary curved incision was made, the incision being made so that he was able to remove all the ribs from the second down along the costal cartilage to the bottom of the pleural cavity and along the tubercle of the ribs posteriorly up to a corresponding height. The incision through the soft parts was made by a single sweep of the knife, the parts dissected, the arm carried over the head, and the soft parts retracted with large hooks, and then with a curved rib-cutter the ribs were divided, the cartilage very readily and the ribs on the posterior side. The whole operation was done as quickly as possible because of the danger of collapse. There was no hæmorrhage requiring a ligature. There was oozing from a few blood-vessels, which were caught with clamp forceps. The soft flap was turned up, which gave a beautiful view of a dextrocardia. Pulsations could be seen because the whole left side of the man's chest was exposed to view. The lung was collapsed and bound down; there was a thick plastic exudate covering the lung and pericardium, and the surface of the chest wall, which was removed by a large spoon curette, scraping away rapidly, and the operation was completed by packing the cavity with strips, four inches wide, of iodoform gauze in layers, brought out at the posterior angle of the wound. The upper portion of the wound was closed with a few interrupted sutures, and nearly all the anterior and lateral portions closed in the same way. The cavity had not yet completely closed. The upper two-thirds of it was closed, but there was still a small cavity below where he did not remove the ribs quite far down. There was one point of infection over the costal cartilage (about the sixth or seventh costal cartilage) where there was a spicule of bone, where he did not trim the edge as closely as possible.

The cause of the empyema was a tubercular pleurisy primarily, a mixed infection, with the ordinary after-history.

Dr. Steele said the Schede operation was reserved for only a limited number of cases. In young people the majority of the cases of empyema got well, perhaps, with multiple aspirations; another large number of cases were cured by a less radical operation than this, known as the Estlander operation, by which a portion of the ribs only, usually upon the anterior part of the chest, was removed. But there were a certain number of cases, however, in which the chest wall would not collapse, and in which it was impossible to obliterate the empyema cavity unless one removed the ribs and soft parts and curetted, freshening the parts, so that the opposing pleural surfaces might be covered with a fresh integumentary and muscular flap after the removal of the ribs. This would enable the obliteration of the cavity except on the left side, where there remained the condition now observed.

He saw a case six years ago that was operated by Dr. Roswell Park, of Buffalo, which presented very much the same appearance as this man's case presented several years after operation, in which the empyema cavity had become completely obliterated, but there was a window-like appearance of the chest, the serous surface having assumed a parchment-like, dry appearance, and the man carrying one-quarter pound of cotton batting to protect the pericardium from external injury. He thought the same thing would occur in this case, although he hoped the cavity would become obliterated. It did not appear now, however, as though it would be. He hoped the concave or cup-shaped cavity would stop secreting after awhile. It might remain permanently open, but without discharging, provided the man lived long enough. In the upper portion of the right lung there were already new foci of tubercular infection; patient's sputum contained a large number of tubercle bacilli.

He exhibited the ribs that were resected from the left side.

Dr. Arthur Dean Bevan confirmed what Dr. Steele had said with regard to the difficulty of obliterating the cavity at the upper portion of the pleural space. In text-books, and in many descriptions, the cavity is described as being one with the largest portion below. As a matter of fact, in almost all empyemas the large cavity is above, opposite the second, third, and fourth ribs,

sometimes as low as the fifth. The lower part of the space, as a rule, was obliterated by the gradual encroachment of the diaphragm upon the lower part of the pleural space, the crowding up being produced by intra-abdominal pressure, and a lack of similar opposing pressure, or the normal pressure one would expect from the lung. He had found in his cases both by filling the cavity with iodoform emulsion and taking an X-ray view, and at the time of exposure the large part of the cavity was at the upper angle. He thought that it was a simple matter to obliterate in an empyema case the lower part of the space. The great problem, however, was to obliterate the upper portion.

In the last three cases operated on by the Schede method, he had adopted a scheme which had been of a great deal of value, namely, after making a Schede operation, early encouraging the patient to develop the lung on the opposite side, or the remnant of the lung on the affected side, by persistent efforts at respiration, either with a water-bottle or with a rubber bag, and in two cases the results had been admirable. In the case of a boy, six years of age, in whom there was quite a considerable cavity at the upper angle, he started him shortly after the Schede operation at blowing up a rubber bag every day, even before there was any effort at much repair, and there was developed opposite the second and first ribs enough lung tissue to obliterate entirely the cavity. And he wanted to make that special point, although he had called attention to it before. But he thought it was really worth while to emphasize the point in empyema, that the difficult portion of the cavity to obliterate was the upper part, and that very early; if one did a Schede operation before wound repair was at all complete, effort should be made to expand the upper portion of the lung or to fill in that portion by an expansion of the lung of the opposite side.

LEFT INGUINAL CONGENITAL HERNIA, WITH TWO TESTES ON THE LEFT SIDE.

Dr. A. E. Halstead presented a man, thirty years of age, who was operated upon at the Cook County Hospital on the 11th of April, this year, for a left congenital inguinal irreducible hernia, which contained omentum at the time of the operation.

He showed him because the patient presented an interesting anomaly in the development of the testicle. After opening a

very large sac and ligating off a portion of the omentum, he pulled up the cord, which seemed to be rather thick, and in doing so dislocated from the left side of the scrotum a pair of testicles. The epididymis was very large and fused, showing the two organs that had originally existed. The cord contained two vasa deferentia, two spermatic arteries, two sets of veins, inclosed in one vaginal process. This double cord passed through the left inguinal canal. The right side of the scrotum and the right inguinal ring were empty.

He did not have an opportunity to photograph the specimen at the time, but he thought the members by examination could determine that there was no right spermatic cord, and that the left side of the scrotum contained two testicles.

The hernia presented nothing unusual, excepting that it was somewhat larger than is ordinarily seen. A rectal operation was performed on the man afterwards, and he learned that the prostate was symmetrical. There appeared to be but one large seminal vesicle.

ADVANCED HODGKIN'S DISEASE.

Dr. Daniel N. Eisendrath presented a patient who had been under X-ray treatment by Dr. J. F. Smith, during which time he had shown remarkable improvement. He said it was a case of very advanced Hodgkin's disease, in which internal treatment had been tried for a number of years without much benefit.

Dr. Joseph F. Smith said the man was twenty years of age, and about five years ago first noticed the appearance of these swellings in the neck and axilla. About six weeks ago patient was sent to him by Dr. Eisendrath, with the request that he be treated with the X-ray. The patient was under X-ray treatment three or four times a week, and since that time he had improved very materially. At the time treatment was commenced his neck was eighteen and a quarter inches in circumference, and in making a measurement a sort time ago he found there had been a diminution of about one inch and a quarter in circumference. The patient had had a marked reaction from the use of the X-ray two or three times, so that treatment had to be discontinued on that account. The glands in the axilla had responded much more rapidly to the influence of the X-ray than

had those in the neck, although at the time treatment was commenced he had an enormous mass of glands on the left and right sides of the neck. The mass of glands in the axillary space had nearly disappeared.

Patient was operated upon two years ago by Dr. Halstead, who removed at that time a mass of glands from the left side of the neck, but there was a recurrence in a short time. The interesting features in the case were the number of enlarged glands and the degree with which they had responded in six weeks to X-ray exposures. There were still a great many enlarged glands present, but the neck had diminished very materially in size.

DR. EISENDRATH said that Dr. Halstead mentioned the fact to him that he had operated upon the patient two years ago for tubercular glands of the neck. He (Eisendrath) had under observation at the present time an atypical case of Hodgkin's disease. There were twenty or twenty-five glands on both sides of the neck enlarged; also a number in both axillæ and both groins. Dr. Burroughs, who is associated with him in the clinic, told him that he had operated on the man himself a year ago and removed caseous tubercular glands. This case brought up the point as to whether there was a certain relation between pseudo-lymphatic glands and tuberculosis. His attention was called to this in Vienna in 1892, during which time he saw a number of cases of Hodgkin's disease in which there were tubercular lesions shown in various parts, as tuberculosis of the spleen, liver, and so on.

DR. HALSTEAD stated that he had operated on this patient two years ago, at which time he removed several enlarged cervical and axillary glands on the left side, sections of which were made for microscopical examination, and which were shown to be typical tubercular glands. A large number of tubercle bacilli were found. There was nothing at that time to indicate that the man had Hodgkin's disease, and personally he did not believe that he had such a disease now. The man did not look like a patient who had Hodgkin's disease. His great muscular development, lack of anæmia, and his general good physical condition spoke against such a diagnosis. The fact that the man had two years ago nothing but tuberculosis led him to believe that the case was one of the type of pseudoleukæmic glandular tuberculosis, and not Hodgkin's disease.

DR. EISENDRATH replied that the diagnosis of Hodgkin's disease was made on account of the blood findings being negative. If he remembered rightly, there were 10,000 leucocytes, with none of the other characteristics. The number of red corpuscles was normal. Then, too, he considered the large number of enlarged glands, and their universal distribution over the different glandular regions. He did not know that the patient was coming to the Society this evening, as, if he did, he would have given the case and its history more careful consideration. At a glance, however, one would scarcely think it was anything else except the typical picture one was accustomed to see of Hodgkin's disease. On account of the great improvement under X-ray treatment, he requested the privilege of showing the patient.

In going over the differential diagnosis of this case as to whether it was Hodgkin's disease or not, he could not see what else it could have been, except it be one of those cases of atypical Hodgkin's disease which he had at the present time, and was on the border-line between Hodgkin's disease and tubercular glands of the neck, which border-line he did not think was sharply set. There were cases, like the one he had under observation at the present time, in which the number of enlarged glands did not show any tendency to caseation. Furthermore, there were so many enlarged glands scattered in different parts of the body that he hardly knew what to call the case except an instance of Hodgkin's disease.

DR. L. L. MCARTHUR called attention to a fact brought out by Dr. Reed, of Johns Hopkins, that fully 50 per cent. of these cases in which the glands were examined microscopically, with the clinical diagnosis and ear-marks of Hodgkin's disease, were proven to be both histologically and microscopically hypertrophic glandular tuberculosis.

DR. HALSTEAD called attention to the work of Fisher on diseases of the lymphatics in which he (Fisher) describes a type of tubercular lymphatic disease, or the pseudoleukæmic form of lymphatic tuberculosis, in which there was but slight tendency to caseation. The disease progressed usually to a fatal termination. He had seen such a case at the Cook County Hospital, where the post-mortem examination, made by Dr. Hektoen, where the bronchial glands resembled a bunch of bananas. The glands were

very large, and many of them were examined, but none showed any signs of softening or of breaking down. In all tubercle bacilli were found in great numbers.

DISTENDED GALL-BLADDER.

Dr. William M. Harsha reported the case of a woman, aged fifty-three years, who was first seen with Dr. R. E. Brown, July 10, 1904. History then obtained was that patient was seized with general abdominal pain July 5. Distention of the abdomen increased gradually without temperature; there was no bowel movement since attack; vomiting more or less every day, assuming intestinal character the last two days. July 10, temperature, 100° F.; great abdominal distention, intestinal regurgitant vomiting, anxious expression; small pulse, 100.

A median incision was made below the umbilicus. Exploration of the abdomen discovered an enormously distended gall-bladder, reaching below the level of the umbilicus; intestines distended, with no other cause apparent. Median incision was temporarily closed by gauze sponges. Incision was made over the site of the gall-bladder, and the gall-bladder emptied of a pint or more of mucus and bile, including forty or fifty gall-stones, some of which occluded the cystic duct. After draining the gall-bladder in the usual way, a ventrofixation of the uterus was done, and a median incision closed. There had been for some years complete prolapse of the uterus. The patient made a prompt recovery. Bowel movements occurred within a few hours after the operation. He had been able to find no such case recorded in the last five years. But the late Professor Fenger reported a case of this kind in the *Chicago Medical Recorder*, 1898, page 310, as follows: "Symptoms of acute intestinal obstruction, seemingly with peritonitis, and nothing to point to the biliary tract. Median incision. Peritoneum normal throughout. Intestines uniformly distended and nowhere obstructed. A distended gall-bladder was the only abnormality found. The median incision closed and lateral one made over the gall-bladder. Gall-bladder considerably enlarged, tense, free from adhesions, and somewhat congested. Thinking the condition of the gall-bladder might not be the cause of the obstruction, but that the latter might be dynamic and of unknown cause, I resolved upon cholecystostomy in two stages. The symptoms of absolute obstruction continued

unabated. After thirty-six hours the gall-bladder was opened, pus and stones evacuated, and symptoms of intestinal obstruction ceased immediately.

OVARIAN CYST WITH TWISTED PEDICLE.

DR. HARSHA narrated the history of a woman, thirty-three years of age, who for several years had had attacks of obstruction of the bowels lasting three or four days, during which time she was confined to bed with pain and vomiting. November 27, 1904, she was first seen by Dr. Harsha when she was just recovering from the most severe attack of this kind which she had ever experienced. Her physician, Dr. Hilton, gave the following account of the attack: November 23, patient was suffering from profound shock; cold surface, irregular pulse, vomiting of intestinal contents, and constant desire to empty the bowels. The exhaustion amounted to collapse. There was no bowel movement for four days. Examination on November 27, 1904, discovered a small ovarian cyst on the right side. Operation, December 1. Cyst found the size of a small orange, with twisted pedicle, which was removed, patient recovering promptly, and having no symptoms of intestinal obstruction since. No peritonitis apparent; no gangrene of cyst; twisting not sufficient to shut off blood supply. There were slight adhesions at the outer side of the cæcum, at the end of the appendix, evidently of long-standing, and apparently not capable of causing any symptoms of obstruction.

To this case he added an account of a second case in the person of a woman thirty-five years of age, who was first seen with Dr. Z. H. Going, April 24, 1905. He gave the following history: April 21, patient had pain in the right lower abdomen. Two weeks before she had similar pain, which ceased in two days. The patient was in bed, with the right thigh flexed; great tenderness over the right lower abdomen; vomiting; no temperature; pulse, 78. April 22, less pain, due probably to anodyne. Examination showed a fluctuating tumor in the right side of the pelvis; great abdominal tenderness. April 24, pain severe, patient restless, with anxious facial expression; pulse, 105; temperature, 101.5° F. April 25, operation performed. An ovarian cyst the size of a fœtal head, with twisted pedicle, was found and removed. The cyst and pedicle were black to within an inch of

the uterus. Prompt recovery followed the removal of the cyst. In this case there was obstruction of the bowels since the date of the attack, April 21. But the symptoms were not so urgent as in the former two cases. There was no intestinal vomiting. It was not uncommon for two or three days to elapse without bowel movement. Operation was not done for the relief of obstruction of intestines only, but on account of the tumor, with increasing signs of infection. Vaginal section was first made, and tumor palpated. It readily passed up from the pelvis to the abdomen, presenting a central fluctuating tumor. A median abdominal incision was then made. In the first case of distended gall-bladder, it might be that the pressure on the colon was sufficient to cause obstruction. There was no peritonitis, and no pus in the gall-bladder.

In the other two there was no involvement of the intestines in any mechanical way that would account for the obstruction, and it seemed probable the obstruction was reflex. In none of these cases was there any evidence of local peritonitis to which the obstruction might be ascribed.

Dr. A. J. Ochsner said he had seen a duplicate several times of the first case reported by Dr. Harsha. He had seen several cases of intestinal obstruction similar to this case and from the same cause, and in each instance the obstruction was supposed to be mechanical. He had opened the abdomen a number of times in cases in which there was obstruction opposite the entrance of the common duct, in which there was a distended stomach and distended duodenum, and upon lifting the transverse colon the jejunum was found in the same condition which one sometimes finds other portions of the small intestine, simply assuming the form of a string, and in these cases the patients vomited bile precisely as they did in case of mechanical obstruction. The obstruction was in the cystic duct, or, as in one case he saw, it was in the lower end of the gall-bladder, due to a wedged-shaped stone which had lodged in this position.

Symptoms of obstruction in connection with ovarian cysts, with twisted pedicles, were not so very uncommon. He had seen such cases, and in one the patient's abdomen was opened by a country physician for the relief of the obstruction, and finding a black mass, the patient was transported to the Augustana Hos-

pital in this city, and the speaker found the condition which Dr. Harsha described in his second and third cases. He recalled several such cases among his cases of twisted pedicle, one an early one, in which he and a number of others made a diagnosis of mechanical obstruction, volvulus; but the operation showed the presence of an ovarian cyst with twisted pedicle. It is easy to make a wrong diagnosis in these cases because the history corresponds to that of a volvulus.

BROWN ATROPHY OF THE HEART AS A RESULT OF CHOLECYSTITIS AND A COMPLICATION OF CHOLECYSTECTOMY.

Dr. Bayard Holmes read a paper with the above title, for which see Annals of Surgery for December.

Dr. Daniel N. Eisendrath asked how the post-mortem findings could be reconciled with the clinical symptoms of sudden dyspnœa, cyanosis, and death?

He asked whether a search was made of all branches for embolism of the pulmonary artery or a blood-clot lodged in one of the branches of the pulmonary artery, because those dangers were comparatively frequent after all abdominal operations. A number of such cases had been recently reported in Brun's "Beiträge" and in Heidendoerfer's clinic. He thought it was impossible to avoid these complications.

Carelessness was shown in the examination of the urine, as it was done in ordinary hospital routine work; and one was apt to examine simply a single specimen before operation and be satisfied with it. He thought a rule ought to be made, before opening the abdomen in any case, to have a twenty-four-hour specimen examined, and an examination very carefully made for evidences of nephritis. He had had one experience which taught him a lesson, and that was in a patient older than the one operated upon by Dr. Holmes, in whom there was a latent nephritis. The urine was examined a number of times by her physician; yet after the anæsthetic was given nephritis developed, that threatened her life for at least twenty-four hours, the case terminating in a fatal uræmia.

Dr. Arthur Dean Bevan asked Dr. Holmes if death in his case could not have been ascribed to an atheromatous condi-

tion of the coronary arteries? He had seen cases of death from anæsthesia, posted by competent hands, and yet nothing else was found at the post-mortem examination to explain the death except a general atheromatous condition, and especially atheroma of the coronary arteries. It was a well-recognized fact that, even without an anæsthetic, a condition of atheroma of the coronary arteries was capable of producing sudden death, being preceded by cyanosis and dyspnœa. He remembered distinctly a case occurring in the pathological institute in Leipsic, in which death occurred shortly after the administration of the anæsthetic, within an hour or two, in which the same picture was found, and Birch-Hirschfeld ascribed death to atheroma of the coronary arteries, or to an atheromatous condition rather than to any other fact.

He thought it was too early to place the sudden death in Dr. Holmes's case in the category of cases which were now being very carefully studied of the late poisonous effects of anæsthetics, accompanied with acid intoxication. These usually appeared later, seldom inside of thirty-six hours, and from that time on, and would be accompanied with fatty changes in the liver and kidneys, possibly with the changes which Dr. Holmes had described also in the heart, although Dr. Bevan imagined they were chronic in character.

Dr. Holmes, in closing the discussion, said the autopsy was made with the utmost care and deliberation, and the blood-vessels of the lungs were examined for thrombi as well as the blood-vessels of the liver and those in the neighborhood of the operation. He had neglected to say, however, that the cœliac axis was very extensively atheromatous; while there were only a few patches of atheroma in the hepatic, gastric, and splenic arteries.

Examination of the urine was conducted in this way: A single specimen was passed and examined in the office when he first saw the patient, and before he had any assurance the case would come for operation. Some weeks afterwards the patient appeared for surgical treatment, and at that time a twenty-four-hour specimen was examined; a second specimen was also examined, but it was not a twenty-four-hour specimen. After the operation, six ounces of urine were passed and examined; after death the bladder was catheterized, the urine examined, but in

none of these examinations were any casts discovered or any albumen found. How this could have been the case, he did not know, because he thought the woman ought to have had casts in her urine, and that these should have been discovered, and if they had been discovered, it would have put him on his guard.

It was an oversight not to have had an expert to examine her heart. His own opinion was that the woman died from disease of the coronary arteries, just as an old man of seventy might die after an anæsthetic. It seemed rather remarkable to him that this woman had died under the circumstances, as the operation was extremely short, occupying only thirty-eight minutes, which included scrubbing of the abdomen before the operation, and the application of the dressing. Gas and ether were the anæsthetics used. There was one thing radically wrong. The woman was allowed to go out; she had two or three dinners in the week before operation, and at these dinners she had something to drink as well as something to eat. She had a good time. He thought this was absolutely wrong under the circumstances and the condition she was in.

The temperature was subnormal after the operation; it was never normal, and it was 97.5° F. at the lowest. Immediately before death the pulse rose to 120, and during the last twenty minutes of life the pulse went down to 80 and 50, according to the count of the interne. The changes were so rapid that, although he started for the hospital as soon as he heard things were going wrong, the patient was dead before he reached the hospital.

Stated Meeting, June 7, 1905.

The President, L. L. McArthur, M.D., in the Chair.

BIOLOGICAL ASPECT OF CARCINOMA.

Dr. G. N. Calkins, of Buffalo, N. Y., after discussing at length the reasons why the differentiated epithelial cell began the process of abnormal division, resulting in the development of

carcinoma, mentioned the studies that had been undertaken relative to the nature of division energy of the cell, to find out what it was that would control it, what would increase its activity, what would decrease its activity, what stimuli were necessary, what conditions of metabolism and morbidity had their effects upon the division energy of the cell, etc.

He mentioned the theories in vogue which had to do with the explanation of the stimulus of division energy of the cell. Of the various theories advanced, he considered only two. The first, Marchand's, which was analogous to the stimulus of the insect poison on plant cells; and, second, the parasitic hypothesis.

He made a brief statement of the work on mice which they were doing in the study of cancer at the State Cancer Laboratory in Buffalo. They had in Buffalo some 200 mice with carcinoma. The original tumor came from a mouse which Dr. Gaylord brought with him from Professor Jensen's laboratory in Copenhagen in February, 1904. The mice Dr. Gaylord brought with him, when they arrived in Buffalo were dead. They died on the way from New York to Buffalo. The tumors were removed and put on ice. In three days, when mice had been obtained, the tumors were transplanted into normal mice. Fifty per cent. practically of the transplantations took, and a large number of mice developed carcinoma. In transplanting, a bit of the tumor is ground up with salt solution; the fibrous material is removed, and this cancer mush, as they call it, is either injected or inoculated under the skin in the cervical region, about one-tenth of a cubic centimetre being put into each mouse. In from ten days to two weeks a tumor made its appearance, showing that the inoculation was successful. In three, five, or six weeks the mouse developed symptoms of cachexia and ultimately died. The tumors that developed varied in size from one-third the weight of the mouse plus the tumor to one-fifth. These tumors were transplanted from mouse to mouse as they died, nine times in their series. Professor Jensen had transplanted the tumors from mouse to mouse for a period of two and a half years before Dr. Gaylord brought mice from his laboratory to Buffalo, so that altogether there had been, in all probability, about thirty to thirty-five generations or transplantations of this tumor. These tumors were nothing whatsoever but metastases from the original growth. The cells of the old tumor in the new

environment were stimulated to grow and develop into a new tumor. According to the Marchand hypothesis, the primary stimulus which the first mouse received was a poison which originated from a deranged metabolism, from malnutrition, or from some other product of morbidity in the organization of the mouse.

Were we to assume that there was formed in every mouse morbid products which carried the stimulus forward? In other words, can the organism produce a stimulus which carries on its own degenerative disease factors?

On the other hand, according to the parasitic hypothesis, we might assume that the original mouse which developed the primary tumor had a parasite; that this parasite developed a poison. When it came to stimulation and to division energy, there seemed to be some poison of one origin or another. With the parasitic hypothesis, it was a parasite that produced the poison. Should we say that it was a single parasite or a group of parasites which produced the primary stimulus, which carried the division energy through generations of tumors, a large mass of cells which represented ten or twenty times the actual weight or size of the mouse, or should we say that every epithelial cell had within itself parasites which kept on producing a stimulus that kept up the division energy? There was absolutely no morphological evidence in cancer cells upon which to base such a fact.

The advocates of the parasitic hypothesis were forced to the conclusion that the parasite at present must be ultramicroscopic. The speaker, however, did not wish to advocate that view. He said, however, it was gaining ground throughout the scientific world. Scharbin, the most eminent parasitologist, believes in the ultramicroscopic organism. The Pasteur Institute had practically accepted this explanation of many diseases. There were pathologists here and there who were loath to believe in an ultramicroscopic parasite. There was one point which would seem to support either hypothesis, according to the results they had obtained with tumors and mice.

In November of last year a tumor began to deteriorate; the mouse showed signs of natural immunity and ability to throw off the disease that it had taken. A great many mice spontaneously recovered. They had had altogether over 150 cases of spontaneous recovery from true carcinoma in mice. They thought the tumor material was growing physiologically old, and

that it would die out and their means of experimentation would be lost. A tumor, however, was transplanted to a new strain of mice, and the virulence of the cells was restored, so that the mice died in from three to five weeks after inoculation.

Dr. Clews, chemist of the laboratory, conceived the idea that the blood from such a spontaneously cured mouse might have the possibility of immunity. He inoculated some mice who had tumors about the size of a hazel-nut with the immune blood from one mouse that had spontaneously recovered. This was done in a number of cases, and six tumors disappeared by this immune serum. Experiments showed that immunity was successful up to the present time, and carried with it protection to the mice against reinfection.

The experiment was tried again in a slightly different form. Forty-four mice from the same source were taken; twenty-two of them were treated with cancer mush plus the immune serum from the mice which had spontaneously recovered; and twenty-two of them were treated with cancer mush plus the normal blood of normal mice. The only difference between them apparently was the immune factor in those cases in which the mice had spontaneously recovered. In the twenty-two mice treated with this immune serum, three developed tumors. In the twenty-two mice that were treated with normal blood plus the serum, ten tumors developed, just about the proportion of tumors successfully produced by their inoculation method.

This, in brief, was the position, from a biological point of view, of the cancer problem to-day. It was not known what caused the stimulus. It was not definitely known that there was a parasite in cancer. It was not known that the specific poison produced in any way was the cause of carcinoma. Progress was being made. The work being done at the cancer laboratory was of that earnest type which inspired confidence in its results, and it was hoped would ultimately produce good effects.

LAW OF ACCELERATING RISK IN CANCER.

Dr. E. Wyllys Andrews read a paper with the above title for which see Annals of Surgery for December.

THE X-RAY IN THE TREATMENT OF CARCINOMA.

Dr. William Allen Pusey read a paper with the above title, for which see Annals of Surgery for December.

Dr. Arthur Dean Bevan said the first thing that impressed him in the clinical study of carcinoma was that it was primarily a local disease. There certainly was a time in the history of every carcinoma when it was local, limited to one point, sometimes to a few points—concentric foci. One saw clinically occasionally epithelioma, for instance, which, when examined carefully, showed three or four points of invasion very close together. Clinically we saw carcinoma involving occasionally both breasts. These exceptions did not, however, disprove the statement that carcinoma was primarily a local disease.

A second point that impressed him clinically was, that whether carcinoma was a parasitic disease or not, its history was that of a parasitic disease. Whether the researches of the future showed that it was a peculiar clinical stimulus that acted upon the cells and produced these changes, or whether it was a parasite, whether it was purely chemical and independent of any low form of life, or the result of some low form of life, made no difference; the clinical history of carcinoma would remain that of a parasitic disease.

In regard to the present results of surgical treatment of carcinoma, these varied in different regions of the body, and the reports from different clinics varied widely. For instance, some surgeons, who had made several hundred operations for epithelioma of the cervix, state that possibly less than 5 per cent. of these cases were permanently cured. Some men even have gone so far as to state that less than 1 per cent. of such cases are permanently cured by surgery. On the other hand, cancer of the body of the uterus furnished a far greater proportion of permanent cures. Carcinoma of the larynx furnished a comparatively large proportion of permanent cures; while carcinoma of the breast occupied a rather mid-position between extremely fatal carcinoma of the cervix and more favorable carcinoma of the larynx. An analysis of the different statistics of carcinoma of the breast would seem to show that surgical treatment furnished somewhere between 20 and possibly 30 per cent. of permanent cures. In this connection, he said that in the last few years there had been a great effort made to improve the statistics, so far as permanent cure was concerned, from surgical operations in treating carcinoma, and in doing this there had been a certain amount of juggling. In one well-known surgical clinic reports of the

surgical removal of carcinoma of the breast had been extremely favorable. An analysis of the facts, however, revealed this explanation, which in part at least accounted for their very favorable results, *i.e.*, they had there divided their cases of carcinoma of the breast into two groups, and at the time of operation, or rather after the operation was completed, if in the judgment of the surgeon the case was one which gave good prospects of a permanent cure, it was reported. If the case did not, in the opinion of the surgeon, give a good prospect of permanent cure, it was pigeonholed in a second group which was not considered in the final statistics. In other words, only those cases which were, in the opinion of the surgeon, favorable to permanent cure after the operation was completed were reported.

Statistics which were based upon the total number of cases operated upon would seem to give, in cases of carcinoma of the breast, the possibility of permanent cure in from 20 to 30 per cent.

There was one other point that had impressed him very much, and that was the three-year limit in connection with carcinoma. It had been taught at one time that, if a patient lived beyond three years without recurrence, there was little danger of such recurrence. A careful analysis of statistics would show that this was not so. Cases of carcinoma recurred three and a half, four, six, and even ten years after operation. There could be no doubt as to this. There was, however, a gradual diminution in the percentage of recurrences as the time period increased from the date of the operation.

He agreed pretty generally with the statements made by Dr. Pusey as to the value of the X-ray in epithelioma. He thought, however, it should not be used in cases of thick epithelioma, whether the lymphatics were involved or not. Superficial epithelioma was the form in which the X-ray was particularly of value. He would agree with Dr. Pusey, without any hesitation, that in superficial epithelioma the X-ray was the treatment of choice. On the other hand, in thick epitheliomas, say of the thickness of the thumb or the lower lip, it should not be employed. He had used it again and again, and while he had noticed a diminution in size in these cases of thick epitheliomas of the lower lip, yet as weeks went on there was the occurrence of lumps under the jaw, showing general regional invasion. He believed that the

X-ray should be used as an insurance against recurrence after breast amputation for carcinoma, and after operations for carcinoma in locations where we might expect that it would accomplish results. He believed, too, it should be used in the inoperable cases as a justifiable piece of experimental work from which we had reason to hope that we might obtain beneficial results. He felt, however, that the X-ray had been and was being employed, in a manner which required a word of caution from the profession, by men who were using it, and who did not hesitate to call out very loudly the value of their wares simply to make money out of it. There was no doubt but what the X-ray was a valuable agent. It was, however, doing a good deal of harm in the hands of such men, but not, of course, in the hands of scientific men like the essayist.

There were two great dangers from the use of the X-ray. One was that it would produce serious burns in the hands of men who were not experienced in its use; the other was that it would do positive damage when it was used in a case where a surgical operation, if employed sufficiently early, would hold out a good hope of permanent cure, but where delay produced by the use of the X-ray wasted valuable opportunity and lessened the chances of permanent cure.

CORRESPONDENCE.

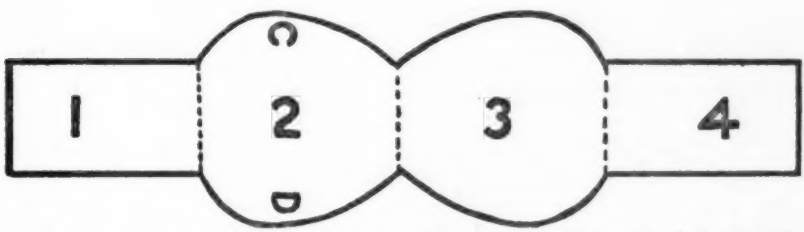
VAN ARSDALE'S TRIANGULAR SPLINT IN THE TREATMENT OF FRACTURES OF THE FEMUR IN INFANCY AND CHILDHOOD.

EDITOR ANNALS OF SURGERY:

WHEN discussing the use of the Van Arsdale splint, Dr. Ware (ANNALS OF SURGERY, August, 1905) in his reference to my report of cases in the service of the late Professor Van Arsdale, has omitted several important details, to which I beg to call attention, viz.:

1. *Measurements.*—The length of the splint equals four times the length of the child's thigh from the groin to the patella.

2. *Shape.*—The shape resembles two "cards of spades"



Segments 1, 2, 3, 4, each cut the length of child's thigh from groin to patella, and flanges C to D the same width. The width of sections 1 and 4 equal thickness of the middle of the thigh. Fold on dotted lines overlapping 1 and 4.

joined at their apices (see Figure), the length of each segment being equal to that of the child's thigh. When segments 1 and 4 are overlapped, an acute (not right-angled) triangle is formed which fits nicely in the angle of the flexed leg. In order that the child may be able to sit on a chair or the floor, the ends of sections 1 and 4 may be cut off an inch or two, rendering the angle more acute.

3. *Adjustment.*—The flanges should be moistened and bent to adjust them to the surface of the thigh and abdomen, thus giving greater security and immobility. When adjusted, the leg should lie in the long axis of the body, not with the thigh abducted.

4. *Effects.*—The extreme flexed position of the thigh relaxes all the muscles and neutralizes any tendency to displacement; the child can sit on the floor or chair and creep about, and the genital and anal regions are well away from the dressings.

It is well to take several reverse turns around the knee and over the angle of the splint to give firmness and maintain a certain degree of longitudinal traction on the thigh.

Plaster of Paris we have never found necessary, nor has the splint been allowed to remain on the limb longer than three weeks. These details, I believe, will be found of use to any surgeon who may desire to make use of this most useful splint.

A. ERNEST GALLANT, M.D.

NEW YORK, October, 1905.

LIGATURE OF THE INNOMINATE.

EDITOR ANNALS OF SURGERY:

I FIND that in my report of cases of ligature of the innominate in the July number of the ANNALS, I unfortunately omitted one very interesting case, to which Mr. B. G. A. Moynihan, of Leeds, has very kindly called my attention. Will you permit me, for the sake of completeness, to send a short abstract of the case now?

H. S., male, aged thirty-one years; admitted to Leeds General Infirmary, October 6, 1897, under Mr. Moynihan. Tumor in neck of thirteen months' duration. Gradual increase in size; treated with potassium iodide and low diet without much benefit. Syphilis when seventeen. Tumor on right side of neck with ordinary signs of subclavian aneurism. Potassium iodide with rest and light diet for two months; no improvement.

First operation, December 8, 1897. Curved incision, with its convexity downward and attached base upward, made over clavicle and subclavian triangle. Clavicle divided at its inner and outer ends and drawn downward; aneurism exposed, cleared, and excised. Cut ends of vessel ligatured with four strands of 00 catgut. Subsequent to operation, erysipelas and secondary wound infection. Wound healed, and patient gained flesh and strength until February 6, the fifty-ninth day after operation, when "something burst" in the neck, the incision reopened, and repeated hæmorrhages took place.

Second operation, February 8, 1898. Flap reopened. On clearing away clot, "terrific hæmorrhage" stopped by putting finger into opening in subclavian artery. Innominate exposed by a curved incision with its convexity downward and to the left; flap turned upward and to the right; centre of flap lay over right sternoclavicular joint. Inner end of

clavicle and adjacent portion of sternum divided and turned upward with attached sternomastoid. Common carotid and innominate ligatured with fine silk. Patient very collapsed, and died one hour later.

Necropsy.—Place of original ligature of subclavian soundly healed. Hæmorrhage due to the rupture of a second aneurism of the subclavian proximal to the first. Extensive degeneration of the walls of the aorta and other vessels. (ANNALS OF SURGERY, July, 1898.)

The addition of this case makes the number of cases of ligature of the innominate thirty-seven, with eight recoveries.

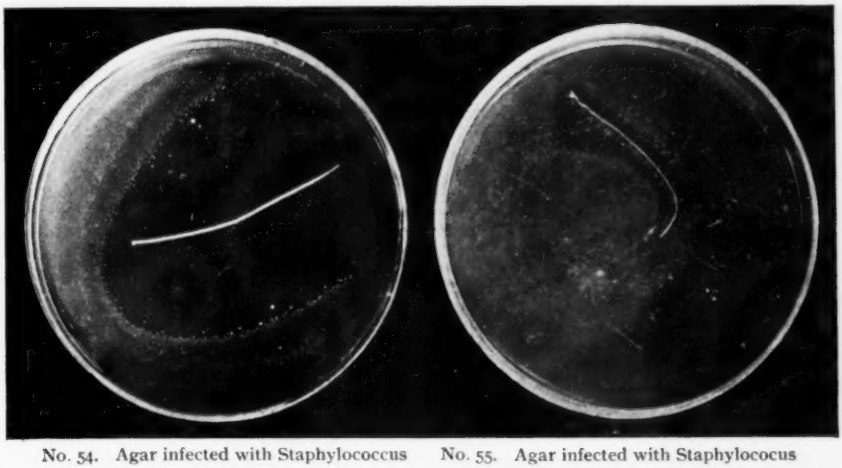
WILLIAM SHEEN, M.D.

CARDIFF, ENGLAND.

"The following plates are to illustrate Dr. Alexis V. Moschocowitz's article on 'Dry Iodine Catgut,' pages 321 to 351 inclusive, in the September number, and are to replace the illustrations opposite pages 326, 327, and 334.

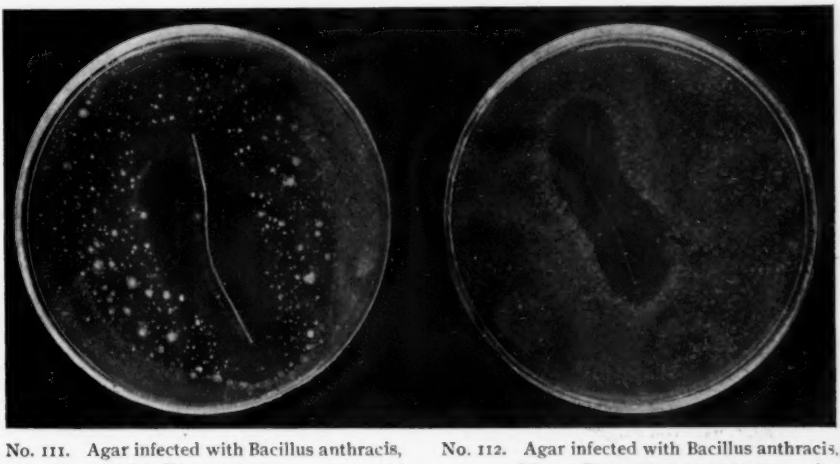
No. 52. Agar infected with Bacillus coli, with iodine gut on top.

No. 53. Agar infected with Bacillus coli, with von Bergmann gut on top.



No. 54. Agar infected with Staphylococcus aureus, with iodine gut on top.

No. 55. Agar infected with Staphylococus aureus, with von Bergmann gut on top.



No. 111. Agar infected with Bacillus anthracis, with iodine gut on top.

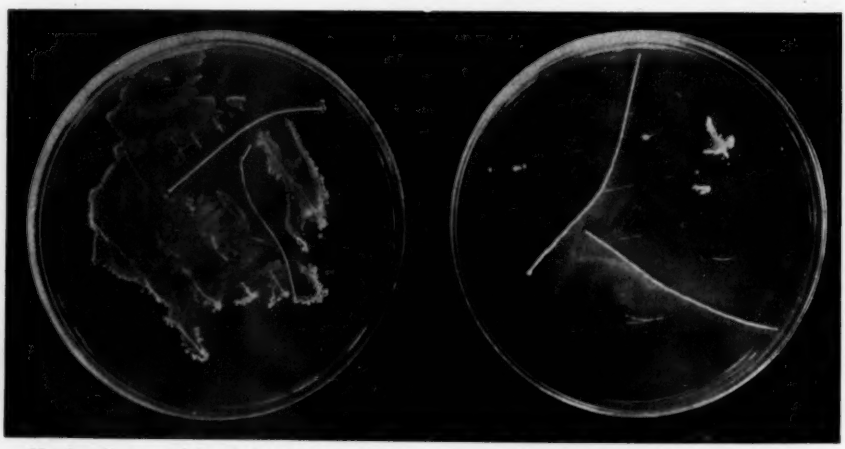
No. 112. Agar infected with Bacillus anthracis, with von Bergmann gut on top.

No. 56. Smears of Bacillus coli on agar, with iodine gut on top.

No. 57. Smears of Bacillus coli on agar, with von Bergmann gut on top.

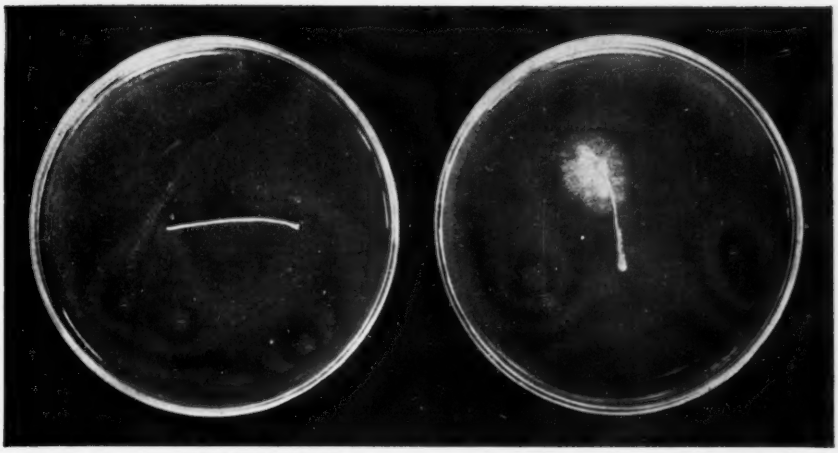
No. 58. Smears of Staphylococcus aureus on agar, with iodine gut on top.

No. 59. Smears of Staphylococcus aureus on agar, with von Bergmann gut on top.



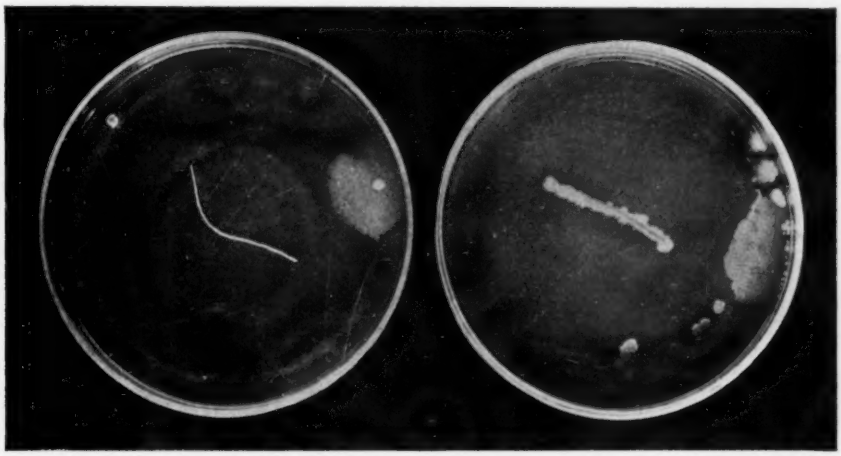
No. 69. Smears of Staphylococcus aureus on agar, with von Bergmann gut on top.

No. 68. Smears of Staphylococcus aureus on agar, with iodine gut on top.



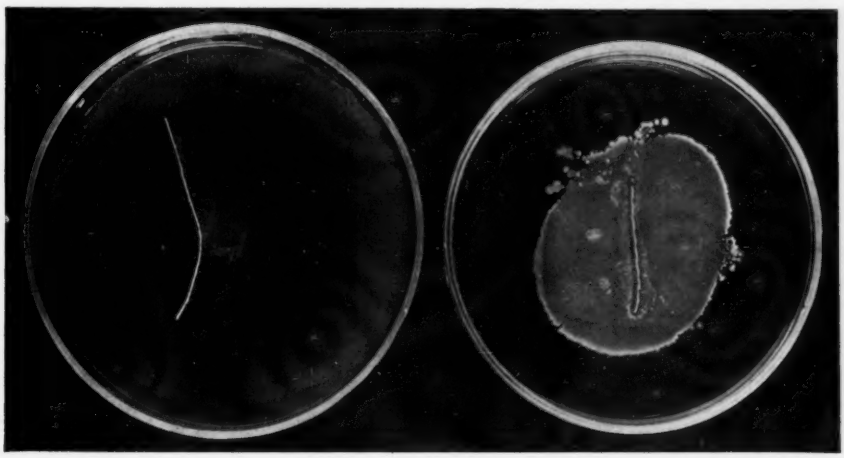
No. 74. Iodine gut infected with Staphylococcus aureus "dry" on agar.

No. 75. Von Bergmann gut infected with Staphylococcus aureus "dry" on agar.



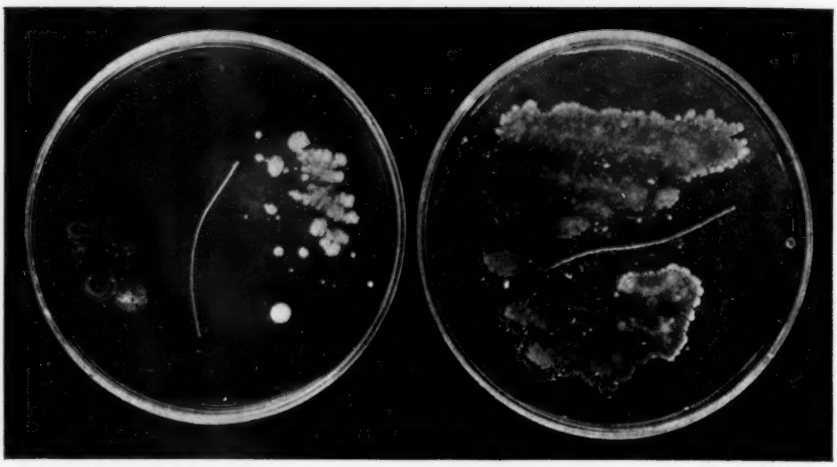
No. 127. Iodine gut infected with Bacillus anthracis "dry" on agar.

No. 128. Von Bergmann gut infected with Bacillus anthracis "dry" on agar.



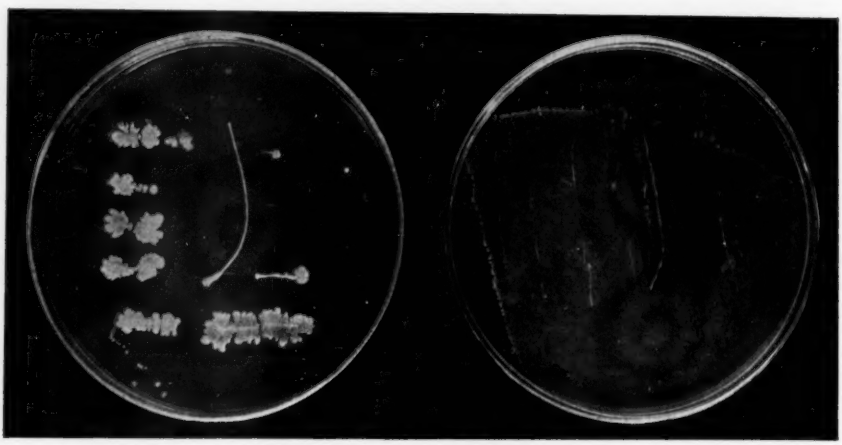
No. 129. Iodine gut infected with Bacillus subtilis "dry" on agar.

No. 130. Von Bergmann gut infected with Bacillus subtilis "dry" on agar.



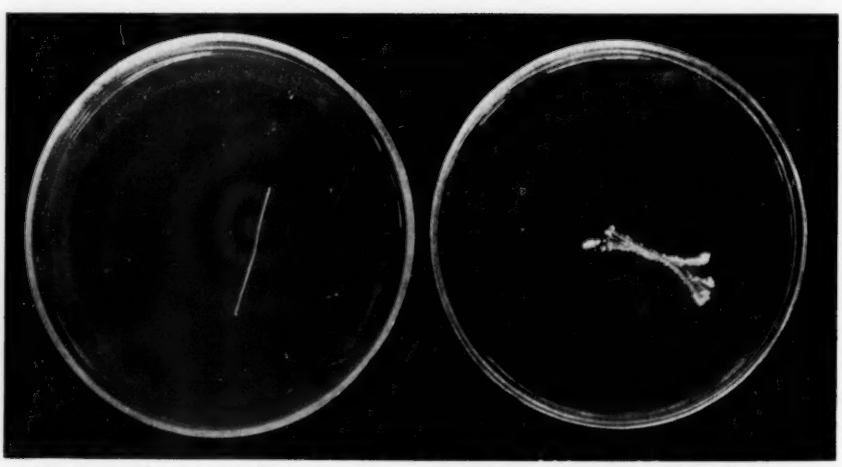
No. 93. Smears of Bacillus anthracis on agar, with iodine gut on top.

No. 94. Smears of Bacillus subtilis on agar, with von Bergmann gut on top.



No. 95. Smears of Bacillus subtilis on agar, with iodine gut on top.

No. 96. Smears of Bacillus subtilis on agar, with von Bergmann gut on top.



No. 72. Iodine gut infected with Bacillus coli "dry" on agar.

No. 73. Von Bergmann gut infected with Bacillus coli "dry" on agar.